

**Preview: THOSE '63 CARS!**

# POPULAR MECHANICS

AUG 1962  
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# THE WORLD'S TURNED UPSIDE DOWN

**THERE'S A HOT NEW COMER UNDER THE HOODS OF TODAY'S WINNERS. IT WASN'T THERE YESTERDAY. TOMORROW? THE RECORD SPEAKS FOR ITSELF.**

Records and Traditions Die Hard at the Brick Yard.

Old Timers looked twice when eight cars showed up for this year's Indy 500 with a new kind of spark plug under the hood. Such things just aren't done in winning circles. Three hours and 34 minutes later it was done. The Silver Fox, Rodger Ward, had his Leader Card 500 Roadster in the winner's circle and a new record of 140.293 mph. Teammate Len Sutton had a solid second to his credit. And smiling Eddie Sachs, who started so far back he couldn't see the starter's flag, had done the impossible. Driving close enough to the wall to carve his initials in it, he left everybody but Ward and Sutton in an insolent trail of exhaust fumes. All of the first three finishers broke the old track record. All of them thumbed their noses at tradition and ran with Autolite Spark Plugs under the hood. Accident? One-in-a-million fluke? Read on.

It all started at Daytona Speed Weeks. Five big races. Three new records. And a strange thing in common about all of them. The NASCAR Continental. 34 GT and sports cars take off. Three hours later Dan Gurney takes the checkered flag. Who finished behind him? Phil Hill, Stirling Moss and 31 others. Lift the hood of Dan's Lotus XIX. Outright heresy. Autolite Spark Plugs.

First 100 Mile Stock. Fireball Roberts romps. Speed (a world's record for 100 miles) 156.999 mph. Spark Plugs: Autolite. Second 100 Mile Stock. Joe Weatherly's turn. Spark Plugs: Autolite.

The 250 Mile Modified National Championship. 54 "anything goes" tigers take off. By the half-way mark, all but 28 of them are in the pits. Odd. Every car left in the race is using Autolite Spark Plugs. Winner Lee Roy Yarbrough. Car: Modified '56 Ford. Speed: 146.723. Spark Plugs? Modesty prevents us.

The big one. The Daytona 500. Briefly, Fireball fried 'em. Speed: 152.529, the fastest speed for five hundred miles ever achieved in an automobile. Spark Plugs: Old reliable, what else?

Chaos at Charlotte. Nelson Stacy sets new world record for 600 miles. 125.552. Autolite equipped cars take 1st, 2nd, 3rd. Revolt at Rebel 300. Stacy

again and his '62 Ford. Autolite equipped cars finish 1, 2, 3, 4, 5, 6, 8, and 10.

What's all this add up to? Simply this. Cars using Autolite Spark Plugs have won every major stock, modified and sprint car race since January 1.

All this might lead one to believe Autolite Spark Plugs are a must for race drivers. But what's that got to do with rush hour traffic in Cedar Falls? Here's the answer. Not in terms of "if racers use them they must be best," but in some rather technical details on how we build our spark plugs. We hope you'll read it through, it's important.

Let's start with compression leakage. To solve this problem racing spark plugs are heat sealed. So are aircraft spark plugs. All of them. Even the ones built by our competitors. The insulator is fused to the steel shell under heat and pressure. This is the most positive way known to prevent this leakage.

And because it is the most positive way, Autolite heat seals every single spark plug it makes. Doesn't everybody? Unfortunately, no. Only about half the standard automobile spark plugs sold are. So next time you plug those holes in your engine, make sure it's a tight fit. Ask for Autolite.

Another point—if you own an overhead valve engine (and 95% of you do) — about fouling in city traffic. We've done something about it. Built a new kind of spark plug called Power Tip. Has a longer electrode made of a special heat resistant alloy that reaches deeper into the fierce heat of engine combustion. Actually uses this heat to burn fouling deposits away. Autolite Power Tip is the spark plug that cleans itself while you drive. If deposits have your mileage on the run, give 'em a try.

Now that we've stated our case, we hope you're inclined to try our products. You'll be glad you did. And don't get us wrong. We've got nothing against tradition. In fact, we're starting one of our own.

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A.J. WATSON

This One



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AUGUST 1962

3



# POPULAR MECHANICS®

AUGUST 1962

VOL. 118

NO. 2

INTERNATIONAL EDITIONS • SPANISH: Mexico-Caribbean, Southern Hemisphere • FRENCH •

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**Pilot  
Chewer**  
page 86



**DANISH • SWEDISH • GERMAN • PORTUGUESE • DUTCH**

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## Next Month

**TIRED OF** week ends filled with mowing and maintaining? Cut down yard work with a lazy man's lawn that almost takes care of itself. And keep home repairs at a minimum with new materials and products. Watch for next month's housing section, featuring PM's Minimum Maintenance House, a dream home with a sunny garden in its center. All this, plus plans for building children's furniture with a Swedish flair in the September PM.

**Bogie  
Hunt**  
page 110



**Outdoor  
Light-up**  
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**38 MPH for \$38**  
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**Old Vac  
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## Classrooms on Wheels

Chicago, like some other cities, is handling the problem of overcrowded schools by parking additional classrooms on lots near the present buildings.

Its school board ordered 150 mobile classrooms to relieve double-shift schools throughout the city. Such rooms cost \$9000 each compared to the \$30,000 needed to build a classroom. They house 30 students with room to spare.

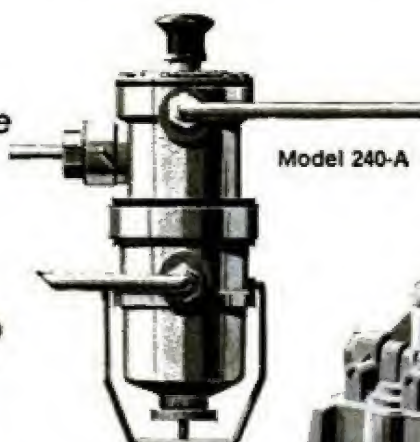
Other features of the mobile classrooms: fluorescent light, Venetian blinds, base-board or forced-air heating, built-in chalkboards, bulletin boards, closets and washrooms.



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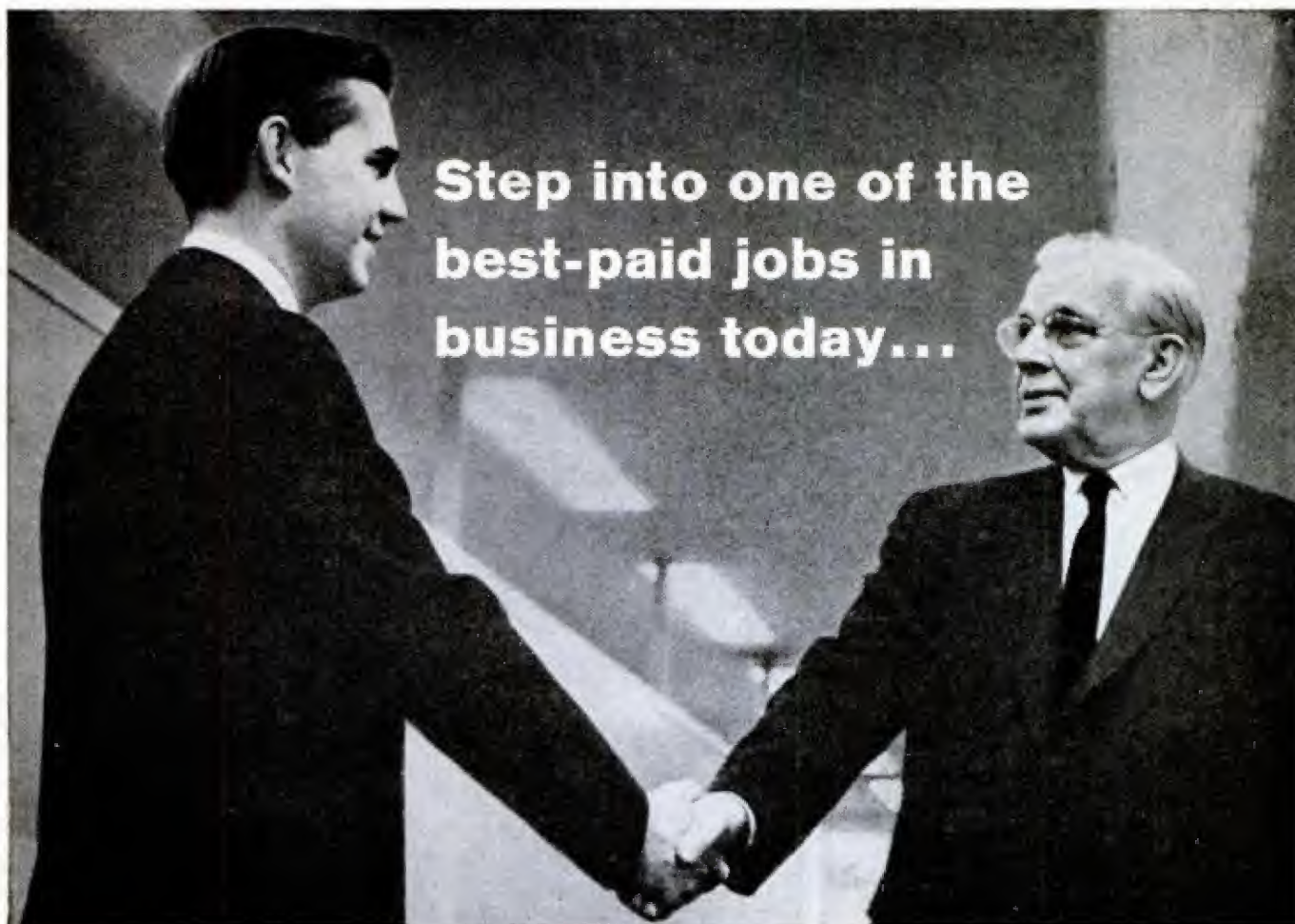
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# Over the editor's desk

## Giant Trout

Read with appreciation your April article on fishing at Tazin Lake, in which you referred to record lake trout caught last August. I was at the dock when this 102-



pound fish arrived and shot a number of pictures of it. I have enclosed one in case you are not in possession of a picture of it. New Sarepta K. O. R. ANDERSSON  
Alberta, Can.

*It's great-granddaddy size, all right, but we should point out that it did not qualify as a rod and reel record, as the fish was caught commercially.*

## Big Brother's Tools?

Although the ideas in George Orwell's novel 1984 have been laughed at, some of the things he mentioned are unfortunately beginning to take shape. I refer to two of your May articles: *They Spy for Industry* and *Keep Up With TV on Your Radio*.

While quarter-mile microphones and rapid-sequence cameras may be useful in trapping criminals, they could, in the wrong hands, be used to sap the freedom and privacy which we Americans take for granted. And while it is a good idea for parents to keep an eye on their offspring's TV watching, radio monitoring could easily be used as a spy system in other capacities. We must make certain the use of such gadgets is kept within safe boundaries. San Antonio, Tex. RICKY ROSENBERG

*Agreed, Rick. And let's make sure those boundaries are located nowhere near another very important gadget—the ballot box.*

## Coming Out for Air

Because I enjoy your magazine so much, I was disturbed to find you erred in reporting the frogmen (page 104, April '62 PM) used oxygen bottles for their air supply. As any diver knows, oxygen becomes toxic at depths below 30 feet.

To the best of my knowledge, the armed forces used compressed air as all divers do. Oxygen is used only for reasons of military secrecy to prevent detection. I am sure it is not required in the rescue work which you described.

Cicero, Ill.

TONY BENNETT

*PM's author, an experienced flyer but a nonscuba diver, says to tell you that you couldn't be right. He promises to do penance by holding his head under water—without either oxygen or compressed air—for a full 60 seconds.*

## Happy Engineers

A friend of mine, Walter Wrigley (on the right in the enclosed photo) and I built two of the trains from your November issue plans, and gave them away as



Christmas gifts. Needless to say, two six-year "engineers" were extremely happy on Christmas morning.

Palatine, Ill.

NELS BARIL

*So were the two Santa Claus' involved, we'll wager.*

## Ruckus Over a Rut

Re your May '62 PM issue, *Is the Indy Race in a Rut?*, my answer is the same as that of the quarter-million people who attend the race: No! These so-called automotive experts are crazy. The publicity now given the race is amazing. The pot of the race alone is \$400,000. The total haul is undoubtedly around \$10,000,000 . . .

Detroit, Mich.

LARRY SHIELDS

*. . . are the ones who criticize Indy in a rut? I doubt if our brilliant, self-styled*

*(Continued to page 10)*

POPULAR MECHANICS



*This story actually happened. The man's name has been changed and this is not his photograph, but the facts are true.*

## "Your name is on the list"



Doug Mott was not surprised. The recession was on and the assembly line where he worked was almost at a standstill.

And then, strangely, the boss began to smile. "You know how the Engineering Department sends us blueprints and then we have to send them back for revision because they just aren't practical to produce?" Doug nodded . . . wondering. "That's waste . . . and we can't allow it to continue. That's why we thought that if we had a man who knew assembly and production — and drafting, too — he could act as liaison man between engineering and production. You know production, Doug . . . and you're studying drafting with I.C.S. You've got a *new* job. Congratulations!"

Doug Mott now heads a drafting room. But he will never forget the day his name was on the list to be laid off.

Good times or bad, I. C. S. training sets a man off from his fellows, puts him on the road to promotion. You can start on that road by filling out the coupon *now!*

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- ☐ Magazine Illustrating
- ☐ Show Card & Sign Painting
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- ☐ Auto Electric Technician
- ☐ Automobile Mechanic
- ☐ Engine (Gas & Diesel)
- ☐ Engine Tune-Up

- ☐ Transmission Specialist

### AVIATION

- ☐ Aero Engineering
- ☐ Aircraft Drafting
- ☐ Aircraft Mechanic

### BUSINESS

- ☐ Accounting
- ☐ Cost Accounting
- ☐ Public Accounting
- ☐ Bus. Administration
- ☐ Executive Training
- ☐ Marketing
- ☐ Personnel-Labor Relations
- ☐ Programming for Digital Computers
- ☐ Purchasing Agent
- ☐ Real Estate
- ☐ Salesmanship
- ☐ Sales Mgmt.
- ☐ Small Business Mgmt.
- ☐ Traffic Mgmt.

### CHEMICAL

- ☐ Analytical Chemistry
- ☐ Chem. Engineering
- ☐ General Chemistry

- ☐ Lab. Technician
- ☐ Nuclear Energy
- ☐ Plastics
- ☐ Pulp, Paper

### CIVIL ENGINEERING

- ☐ Civil Engineering
- ☐ Construction Engrg.
- ☐ Highway Engineering
- ☐ Reading Structural Blueprints
- ☐ Sanitary Engineering
- ☐ Structural Engineering
- ☐ Surveying & Mapping

### DRAFTING

- ☐ Architectural
- ☐ Electrical and Electronic
- ☐ Mechanical
- ☐ Sheet Metal

### ELECTRICAL

- ☐ Elec. Appliance Servicing
- ☐ Electrical Engineering
- ☐ Elec. Eng. Technician
- ☐ Elec. Motor Repairman
- ☐ Industrial Electronic Technician

- ☐ Industrial Telemetering
- ☐ Instrument Technician
- ☐ Practical Electrician
- ☐ Practical Lineman

### ELECTRONICS

- ☐ Automation
- ☐ Basic Electronics
- ☐ Electronic Computers
- ☐ Electronics Technician
- ☐ Hi-Fi Stereo and Sound Systems
- ☐ Industrial Electronics
- ☐ Ultrasonics

### ENGINEERING (Professional)

- ☐ Chemical
- ☐ Civil
- ☐ Electrical
- ☐ Mechanical

### ENGLISH and WRITING

- ☐ Better Business Writing
- ☐ Introductory Technical Writing
- ☐ Short Story Writing

- ☐ Practical English

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- ☐ High School General
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automotive expert made \$140,000.00 in a day last year . . .

Just for those who weren't there, all the Pontiacs at Daytona last February also had a very similar appearance.

Winston-Salem, N. C.

BILL SWAIM

A rut can be a rut, boys, whether it is lined with dollars or mud. Actually, our article knocked down many of the criticisms about Indy and ended up making a fairly strong case for the fact that Indy was probably not in a rut. Then we saw this year's race—from the pits. Thirty-two Offenhauser-dynasty cars out of thirty-three entries all practicing left-hand turns! They were certainly all in the groove but it's just possible the groove is getting deeper.

### Neither Rain Nor Snow Nor . . .

POPULAR MECHANICS writers have a way of encountering unforeseen complications in their eagerness to get their stories. Working on the article you'll find on page 76, author Richard Dunlop (at left in the photo below) returned from Mummy Cave



in Canyon del Muerto with a bulging notebook, some fine photos and a tiny fragment of prehistoric debris lodged in one lung. Seems that a sudden canyon windstorm whipped up clouds of ancient dust from the talus where the cliff dwellers had dumped their kitchen slops, and caught writer Dunlop and his archeologist colleagues without their respirators.

"Some of us will be sick because of this," grumbled one archeologist. The sick one turned out to be our writer, but doctors assure him that his illness is only a slight collagenic disturbance.

In fact, the only remaining symptom is a moderate case of chagrin. Imagine being clobbered by the garbage some Indian squaw tossed out over 650 years ago!

*The Editors*

POPULAR MECHANICS



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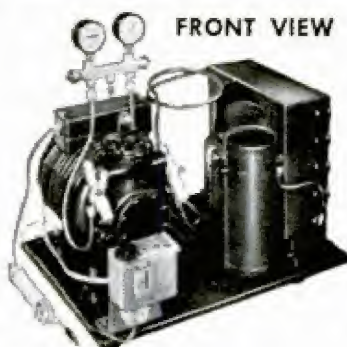
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Illustrated above is a view of the new CTI condensing unit, fully assembled. This is a commercial-type, heavy-duty, 1/4 h.p. unit. You build it from 25 kits of parts (and with tools) that CTI sends without extra cost. In addition, CTI includes 20 Shop Projects, which simulate the kind of problems you are likely to encounter in the field. After assembling your condenser, you may then build an air conditioner, freezer, refrigerator or milk cooler.



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You receive wrenches, tube flaring tools, hammer, tubing, fittings, gauges and many other items used by the experienced mechanic. Everything is of professional quality. Best of all, CTI trains you to use tools with speed and skill.



FRONT VIEW

## Go in Business



Because air conditioning and refrigeration is expanding so rapidly all over the nation, opportunities to go in business are plentiful. Many CTI graduates have accomplished this high aim. Start in a small way, from your own home, and gradually expand. In time you may wish to add a sales division. Manufacturers offer attractive franchises, including merchandising aids, to ambitious, qualified men.

## You learn by practicing with operating equipment

Thousands once learned this rewarding craft just by completing home study lessons. But CTI goes a step farther—and an important step it is! CTI also sends you 25 kits of tools and parts. You build these parts into an operating unit. It's a practical method because you get experience as you train.

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By Jim Whipple



## Mickey Thompson Builds a Better Buick for Indy Henry Ford II Breaks Phoney "Truce"

The Indianapolis 500 turned out just about as expected with the winners driving **Offenhauser-powered** cars with chassis of A. J. Watson's or Frank Kurtis' design. It was, nonetheless, a fairly exciting race to watch, with Parnelli Jones leadfooting to the lead for more than half the contest, only to have his seemingly sure win dribble away by a few tenths of a second every lap after his brakes failed.

It was fun to watch our favorite racing character, "old pro" Eddie Sachs, drive a cool, heads-up race, wriggling his way up from about 27th to a hot third place behind Roger Ward and Len Sutton, while other, greener lads flogged their mounts into expensive junk to right and left. After this performance and his close seconds in 1961, Eddie should really be due next year.

But, win, lose or draw one car alone kept the contest from becoming "pure Dullsville" (*PM*, June 1962, page 87). That was the Harvey Aluminum entry designed and built by West Coast speed merchant Mickey Thompson and driven by a top-notch sports-car pilot named Dan Gurney.

Mickey's car, with its enlarged (256 cubic inches) fuel-injected **Buick Special V8**, was given a mere 20 or 30 laps of participation by the experts who predicted that the **Buick's** pushrod-operated valves would be reduced to shrapnel.

The boys were so wrong. Gurney was running well in 9th place on the 96th lap when the driveline gave way. The V8 was still very much in the game as Dan coasted to a stop. The evident reliability of the engine prompted a phrase from one press-box wit, "When better **Buicks** are built, Mickey Thompson will build 'em!"

In the way that Gurney was able to handle the 1100-pound independently suspended rear-engine sports car, we saw the handwriting on the brickyard wall for the traditional 1600-pound "Indy" cars. The Harvey Special's superior handling qualities enabled Dan to move above, below and around the larger, heavier cars on the banked turns.

When **Thompson** puts all he learned in this race (his first) into the preparations of

similar machinery for 1963 which will enable a driver like Dan Gurney to use the car at its full power potential throughout the race, we may very well see a Detroit production-based engine take the checkered flag for the first time in decades.

In this case the "brickyard" would become a real Detroit proving ground once again.

**Henry Ford II** has announced that The Ford Motor Company will no longer observe the so-called "safety resolution" drawn up by the Automobile Manufacturer's Association in the spring of 1957.

This resolution, dubbed "The Horsepower Truce" was a joint agreement in the interests of safety between all five major automakers to discontinue promotion (i.e., racing) and advertising of the performance and speed of their products.

In Mr. Ford's words "We tried very hard to live with this policy. We discontinued activities that we felt might be considered contrary to principles . . . in the resolution. . .

"For a while, other member companies did the same. As time passed, however, some car divisions, including our own, interpreted the resolution more and more freely, with the result that increased emphasis was placed on speed, horsepower and racing. As a result, Ford Motor Company feels that the resolution has come to have neither purpose nor effect."

We congratulate Mr. Ford on his forthright stand, in spite of our own mighty intense feeling about safety. Let's face it, inept, accident-prone drivers are going to crack up whether or not the maker of the car they're driving fields a team of stock cars at Daytona.

It somehow seems appropriate for a man named Ford to take the plunge and openly go back into racing as a means of promoting his product.

After all, his Grandfather, the man credited with putting America on wheels, first promoted his infant company over 60 years ago by building a fire-breathing hotrod known as old "999" and having a man named Barney Oldfield race it on a frozen lake. ★ ★ ★



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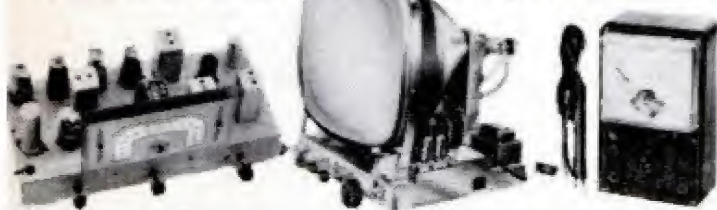
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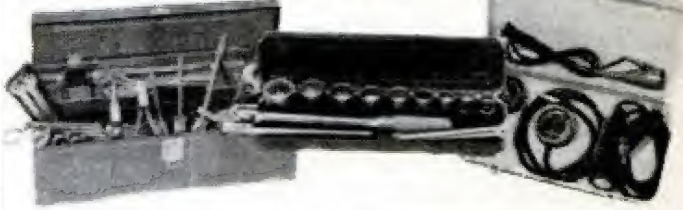
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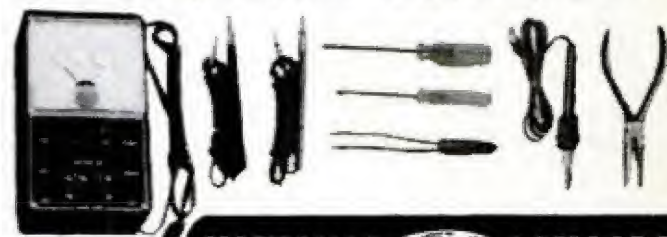
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6



# Science overseas

**By William Kreh**

**Mt. Fuji** may get a coat of cement.

If it doesn't this dormant volcano, a beautiful protuberance on the Japanese landscape, will lose its striking cone shape and end up looking like a broken tooth. For a continuous landslide is destroying the western corner of its summit.

Prof. Shuko Iwazuka of Tokyo University, who proposes the tailoring job, believes the crumbling of sand and rock might be stopped by blowing cement over the entire area from helicopters.

**If you've ever wondered** — in your most wildly idle moment — why those starch-shirted penguins of the Antarctic don't lose their aplomb (or freeze their feet) while standing around on ice at -50 degrees F., then Rowland H. Taylor, a New Zealand scientist, has news for you.

The penguins react to the cold, says Taylor, as though they are continually getting a hotfoot. They rock back on their heels and tail, lifting their feet almost off the ice.

These stuffy birds have also developed speedy blood circulation in their feet which helps ease the pain, and lumpy soles on the bottom of their feet, which decrease the area in contact with their oh-so-cold, living-room floor.

**The Egyptians**, who have had dramatic success in recovering relics of the past from their vast desert land, will soon try to wrest similar success from far under the sea.

Discoveries of statuary on the floor of the sea just outside Alexandria harbor, have led historians to speculate that they might be the remains of the Pharos, the long-ago lighthouse that today is celebrated as one of the seven wonders of the ancient world.

Divers, off Alexandria, are now exploring the possibility of staging one of the greatest underwater rescue projects of all time.

**Calling Dr. Ben Casey!** Far from your TV wonderland of medicine the Russians built operating rooms in helicopters so that teams of Soviet surgeons can fly to remote places and perform operations.

Their MI-4 medical helicopter carries a

team of surgeon, operating room nurse, practical nurse and anesthetist. It also has 230 pieces of equipment stowed away in 16 portable packs.

**The cause of crocodile tears**, perhaps, may be the stones in their stomachs—enough to make anyone, or anything, cry.

A British zoologist recently studied 681 crocodiles in Uganda and Northern Rhodesia and found that all those reptiles carried stones equal to about one percent of their body weight.

This is the exact amount they need for ballast when they are resting on the bottom of a stream.

The rocks also serve as extra weight to help hold down and drown large prey and, says the zoologist, the presence of the stones also accounts for why dead crocodiles are never found in the wilds—they sink to the bottom.

**Lake stagnant?** Turn it over! A new method of keeping reservoirs from becoming stratified and stagnant at their lower levels is meeting with success in Sweden and Ireland.

The method uses "bubble guns"—large plastic pipes which blow big bubbles of compressed air through the water. It was successfully used on a 24-acre lake where engineers sank five 12-inch-diameter, 17-foot-long bubble guns 40 feet below the surface. After 10 days blowing bubbles, they found that the "thermocline" separating the upper oxygenated water — suitable for drinking and fish life — from the stagnant layer had moved down from the depths of 16-29 feet to 23-36, and had made the water usable.

**Turkey's first** atomic reactor, located on the outskirts of Istanbul, is now in operation. It will be used for nuclear research in the fields of agriculture and medicine.

**Gold mine in the sky.** In the mountains of Peru there is probably the most down-to-earth, and highest, dredging operation for mining gold in the world.

The gold-bearing gravel is at the bottom of a 12-foot-deep pit on a plateau 16,000 feet high in the Andes. Some 1500 tons of dredging equipment have been raised up to the pit in order to gain high returns.

**Wiperless wiper.** British scientists have devised a super-efficient windshield wiper for airplanes. Jets of warm air from the engine are shot up in front of the windshield and these jets split the raindrops into non-obscuring vapor.



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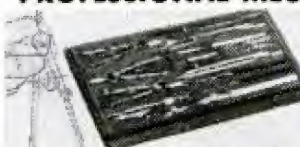
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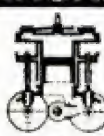
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## Sidelights on aviation

A few days after Scott Carpenter's orbital flight last May, we talked with S/Sgt. Ray McClure, one of the Air Force's parachuting scuba divers who jumped into the ocean alongside the astronaut and his floating capsule. *POPULAR MECHANICS* featured a story on these rescue artists, *The Celebrated Jumping Frogs*, in the April issue.

McClure and Airman John Heitsch spent about 40 minutes on the water with Carpenter before he was picked up and, for the benefit of historians who might wish to preserve some sterling quotes, the conversation couldn't have been more bland.

McClure said he and Heitsch had orders not to ask questions about the flight, and all the astronauts are told to say nothing until the official debriefing.

So, after making sure Carpenter didn't need medical attention and after attaching flotation gear to the capsule (Carpenter later said the capsule was listing badly and probably would have sunk without the gear), the two pararescuemen bobbed up and down on the Atlantic Ocean with a man who had just orbited the earth and talked chit-chat. In fact, Carpenter, a naval officer, led the conversation, asking the two enlisted men about their families, their work, how often they make jumps, etc.

And that's what took place in the Atlantic while the world waited word of the rescue of another American astronaut.

McClure said that he and Heitsch are two of only 65 qualified pararescuemen.

"Some men like parachuting and some like scuba diving, but it's hard to find enough who like both," he said.

If you'd like to do both, the Air Force is looking for you.

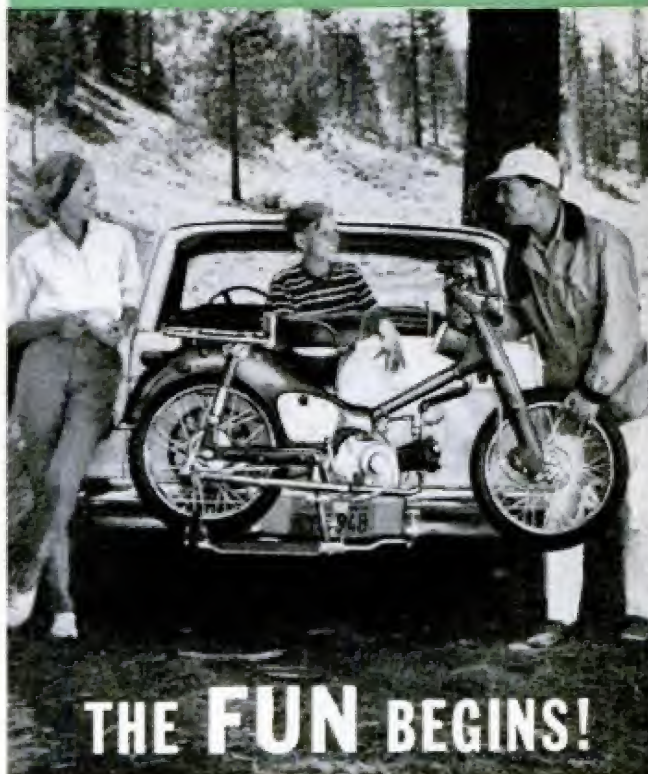
✓ ✓ ✓  
The intercept mission described in the story beginning on page 110 is typical of those that go on daily across the continent. Shortly after we took part in the flight, NORAD announced that, for the first time since it was organized, a full 24-hour period went by without one "unknown" reported.

Normally, at least six unknowns a day have to be intercepted by NORAD pilots and jets—most of whom are from the U.S. Air Force's Air Defense Command. In bad weather, the figure may go up to several dozen.

Kevin V. Brown

AUGUST 1962

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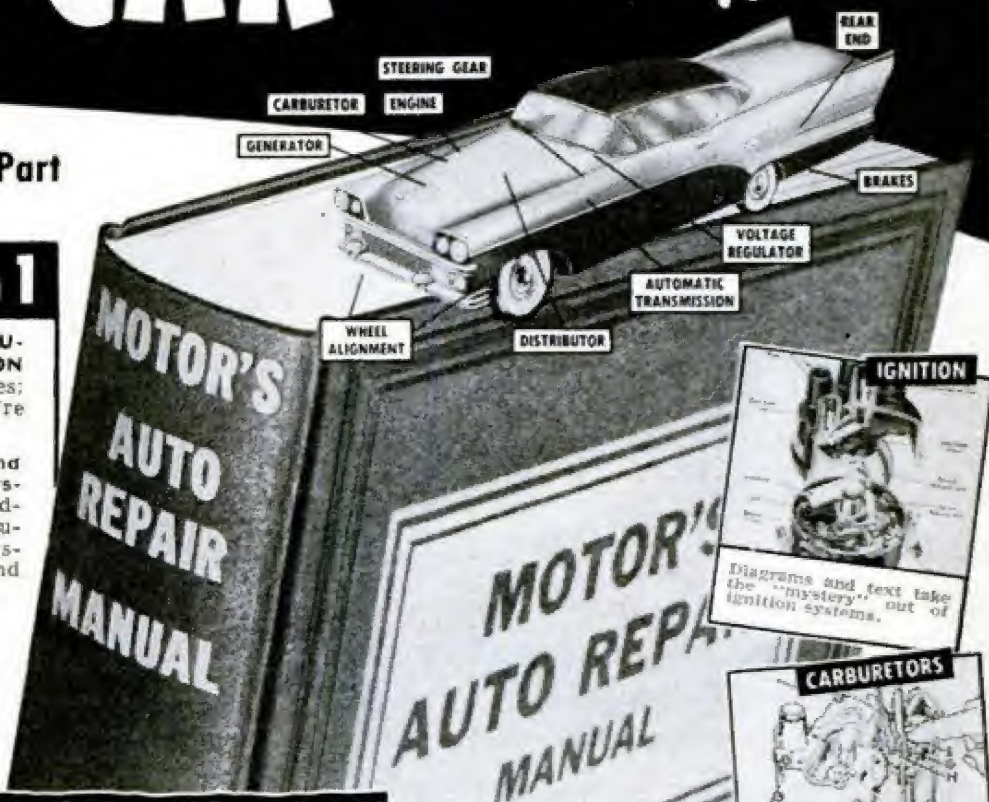
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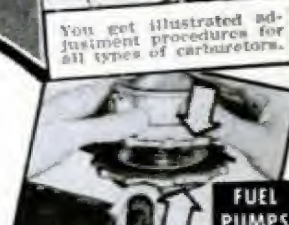
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## Science bulletins

When the traffic light flashes yellow as you approach an intersection, should you slam on the brakes or step on the gas?

It all depends where you are and how fast you are going, reports Dr. Howard Seifert, a Stanford U physicist who has been bearing down, full tilt, on the problem.

He says signs should be placed before the lights and say, for example: "Go from 50 miles per hour;" or "Stop from 30 miles per hour." This would take chance out of this possible life-and-death decision.



You can drink all the snow water you want in the Arctic—should you have to survive there—but you'll still get dried out and be prey to dehydration.

This is a hazard even worse than freezing or starving, say physiologists Terence Rogers and James Setliff. They recently set six men without food, to wander an Alaskan river separately for five days.

Though the six ate all the snow they wanted, they lost energy steadily, and lost a great deal of weight, due to dehydration.



Talk about pressure. Scientists at the National Bureau of Standards are looking through a window only 1/16 inch wide into a tiny world never before seen—a world of pressures of as much as one million pounds per square inch.

The scientists look through a diamond to see what happens when various substances are squeezed between two diamonds. For example, potassium nitrate resembles a stained glass window at pressures under 45,000 psi, but above that it looks like brightly colored marbles.



Radiation gets on the nerves? Researchers at the U.S. Naval Radiological Defense Lab find that sleeping rats will awaken within 12 seconds after exposure to a very low dosage of ionizing radiation (three roentgens). They say the rats' behaviour and emotional reactions might well be altered by being in a radiation field, and promise to find out.

*James Biery*

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# Pentagon sidelights

By William R. Kreh

**The riddle of the crazy garage doors** has been solved by the Air Force.

A man in Dover, Del., installed some new electronic garage doors, but to his dismay they started opening and closing at the craziest times. Upon close notice, the perplexed homeowner saw the doors would always start working whenever a Douglas C-124 transport from the nearby Air Force Base flew overhead. He called on the Air Force. Could it possibly be? A technician came out to check the electric circuit of the doors and, sure enough, found that the propeller beat of a C-124 was just the right frequency to set off the garage doors. A few minor changes were made in the door's mechanism and the case of the erratic garage doors was closed.

**Military targets** photographed from the air can be detected by a new trained electronic eye called the perceptron. The gadget, which is made up of many photo-reactive cells that form an artificial retina, scans aerial photos for objects whose specific shape has been stored in its retina. Not designed to replace the capabilities of a human viewer, the perceptron, instead, can be useful in scanning a great number of photographs quickly and economically.

**A new tow-reel assembly** that is able to hold a missile target when towed at speeds of more than 1000 m.p.h. is being tested by the Navy. The assembly can hold 100,000 feet of cable and reel it in or out at the rate of 5000 feet a minute. The assembly will be used to tow targets from jet planes for air-to-air and surface-to-air missile practice.

**Dizzy, but busy.** Three Navy men recently traveled more than 524 miles in two weeks, yet didn't move more than 20 feet from the point where they started. It was an experiment in a slow rotation room—a room rotating at speed of three revolutions a minute, roughly the speed of a merry-go-round. Tests were made to determine what effect the spinning had on the men's balance, alertness, memory, reflexes and coordination.

**The office wit** may be your boss some day. Air Force research has disclosed that a sense of humor has consistently shown up in the more active, self-confident man.

A study of military humor shows that the good-humored soldier, under stress, does not have demoralizing defensive attitude, has greater independence of thought, is less inclined to dally over making decisions, and less likely to accept a group decision just to go along with the rest of the boys. In short, the guy with the ability to quip when everything seems to be going wrong is the guy who has leadership qualities.

In addition, the study showed that any group of men lacking at least one wit in its midst to ease tensions has lower morale and becomes less efficient under stress.

**No flying after diving,** the Navy says. After a thorough study, the Navy has forbidden its airmen to fly higher than 18,000 feet within 12 hours of scuba diving to depths of 30 feet or more. The extreme changes in pressure in such a short time are too hard on the human system, Navy medics warn.

**Gift wrapped.** Hospital patients were literally wrapped in paper during Army field maneuvers in Alaska recently. Sheets, pillowcases and blankets made of paper were being tested in the subarctic to find how they stand up to rough usage in a field hospital, and if they are as comfortable for the patient as cloth products.

**Chippewa Indians** in Wisconsin recently outbid 21 firms to win an Army contract for production of ammunition boxes.

**A rocket belt** equipped with wings is under investigation by the U.S. Army. It will allow a soldier to "jump" to a desired altitude, cut his power and then use his wings to glide to a particular location.

**There were strings attached** to the agreement signed by the owner of some land leased by the Army for maneuvers in Louisiana or, more precisely, fish lines.

"There is in Kisatchie Bayou, which runs through the northwest corner of my land," the stipulation read, "a catfish estimated to weigh 30 pounds. The hole in which he stays has got to be placed off limits to military personnel. When that catfish is caught I expect to be on the other end of the line."

The Army agreed and at last report the catfish was still in his hole, undisturbed by the maneuvers.





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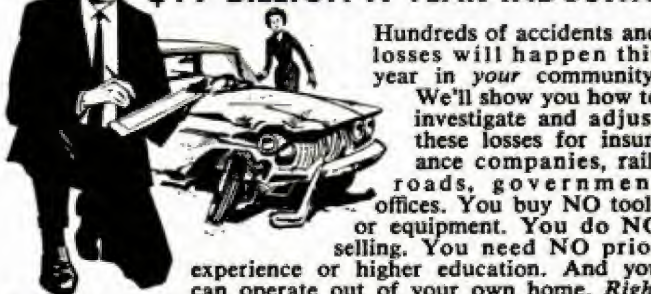
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## Tune in on the inventors

PM's offices were visited last week by Mr. M. M. Horwitz of Chicago, who announced that he had developed an electromagnet that would attract noble metals (gold, silver, platinum, etc.).

It's common knowledge, of course, that no magnet will attract anything but ferromagnetic materials—iron, alloys of iron, and some special alloys such as Permalloy and Heusler alloys. But Mr. Horwitz' invention didn't obey the physical laws. Using a taped and boxed demonstrator (the insides of which we could only guess at) he picked up samples of gold, silver and platinum. The "magnet" would not pick up lighter metals at all, nor any of the non-metallic materials that would have been attracted if it were a static attractor.

Anyone out there want to try explaining his phenomenon to us?

✓ ✓ ✓

An excellent new book on inventions and patenting has been published—perhaps the best yet. It is *Patents, Research and Management*, written by a really distinguished team of 15 experts, edited by Howard I. Forman, and published by the Central Book Co., Inc., 850 DeKalb Ave., Brooklyn 21, N. Y. It's 650 pages of real inside dope for \$15.

✓ ✓ ✓

A Canadian reader, M. Berezanski of Westlock, Alberta, has a problem with an invention. He has been awarded a Canadian patent on a new type of tackle box, but wants to find a manufacturer in this country to handle the American patents. His box, especially designed for big-water, big-fish anglers who use lures that don't fit in ordinary tackle boxes, "files" the lures between dividers not unlike those in a filing cabinet. It'll hold a trip supply of big plugs and spoons in a relatively small box, with the smaller gear stored in a drawer across the bottom.

✓ ✓ ✓

Best patent from a reader this month—Michael Carty's pocket toothbrush and dentifrice reservoir, which is pending its patent, puts the whole works—brush, toothpaste and all—into a package the size of a fountain pen.

Copies of the original patents may be ordered for 25 cents each from the Commissioner of Patents, Dept. of Commerce, Washington 25, D. C.



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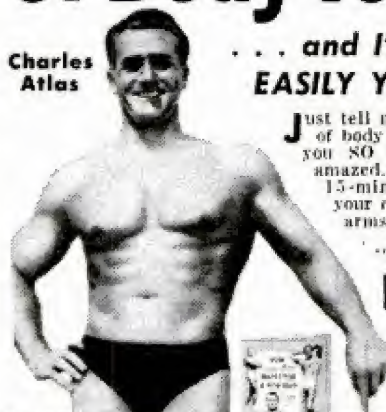
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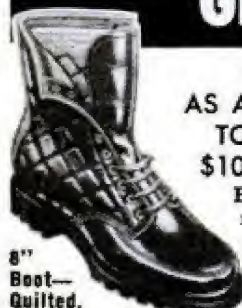
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## Items from all outdoors

Speaking of deep fishing, and I am, on page 92 of this issue, there's a new book that should interest anyone who ever fishes deep, especially for any of the trouts. It's Earl Holdren's handbook, *Fishing Fabulous Finger Lakes Trout*, published by Outdoor Sports Press, Rochester, N. Y.

Holdren, himself an expert, writes of the techniques, lures and equipment used by the famous trout fishermen of New York's Finger Lakes country, who probably are the best in the world. He lists dozens of tricks for finding and catching fish—tricks that are pertinent to any fisherman faced with big water for any kind of fish. The techniques work as well in California or Minnesota as they do in New York.



Still fishing deep, I learned at the same time of a device being patented by Edward A. Elbert of Snyder, New York. His invention (see photo) is a depth-indicating scale for trolling or drifting fishermen. It enables the angler to estimate the depth at which his lure or bait is working from the angle of the line below horizontal and the amount of line that's out.

When clipped onto the working line, the swiveled half of the scale swings to level, and a marker shows in a curved slot. Reading across the scale from the marker, you read the depth of the lure. For instance, at the angle shown in the photo, if you had 90 feet of line out, your lure would be 54 feet deep, less the distance from the rod tip to the water.

It's ideal for use with color-metered monofilament or lead-cored trolling line, since it gives an accurate reading of the amount off the reel. Mr. Ebert has applied for a patent.

*Dick Kiepatnik*

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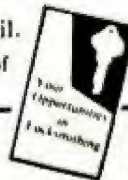
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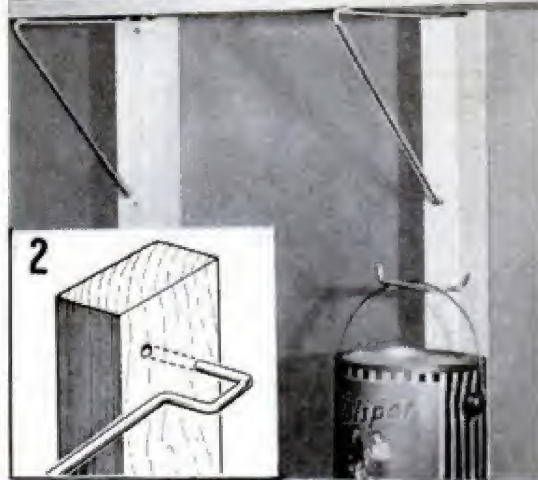
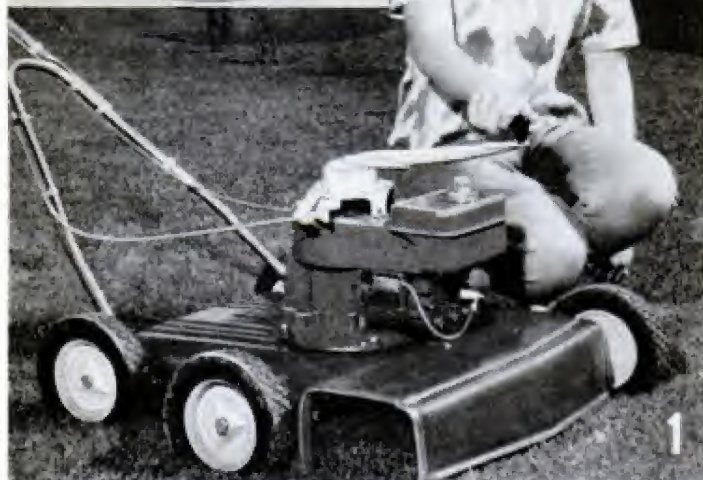
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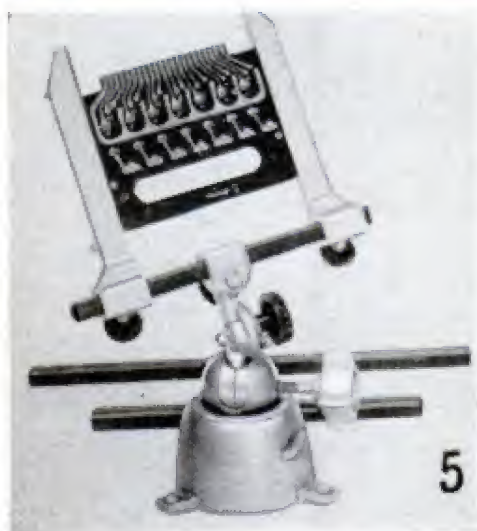
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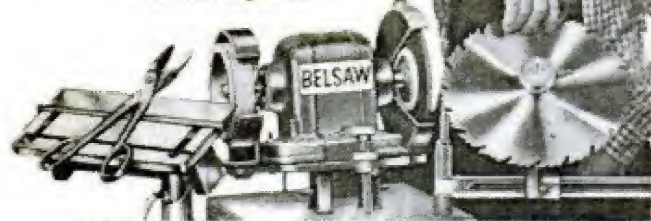
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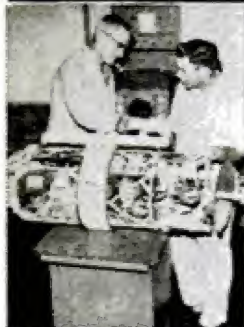
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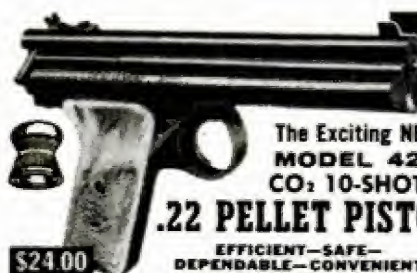
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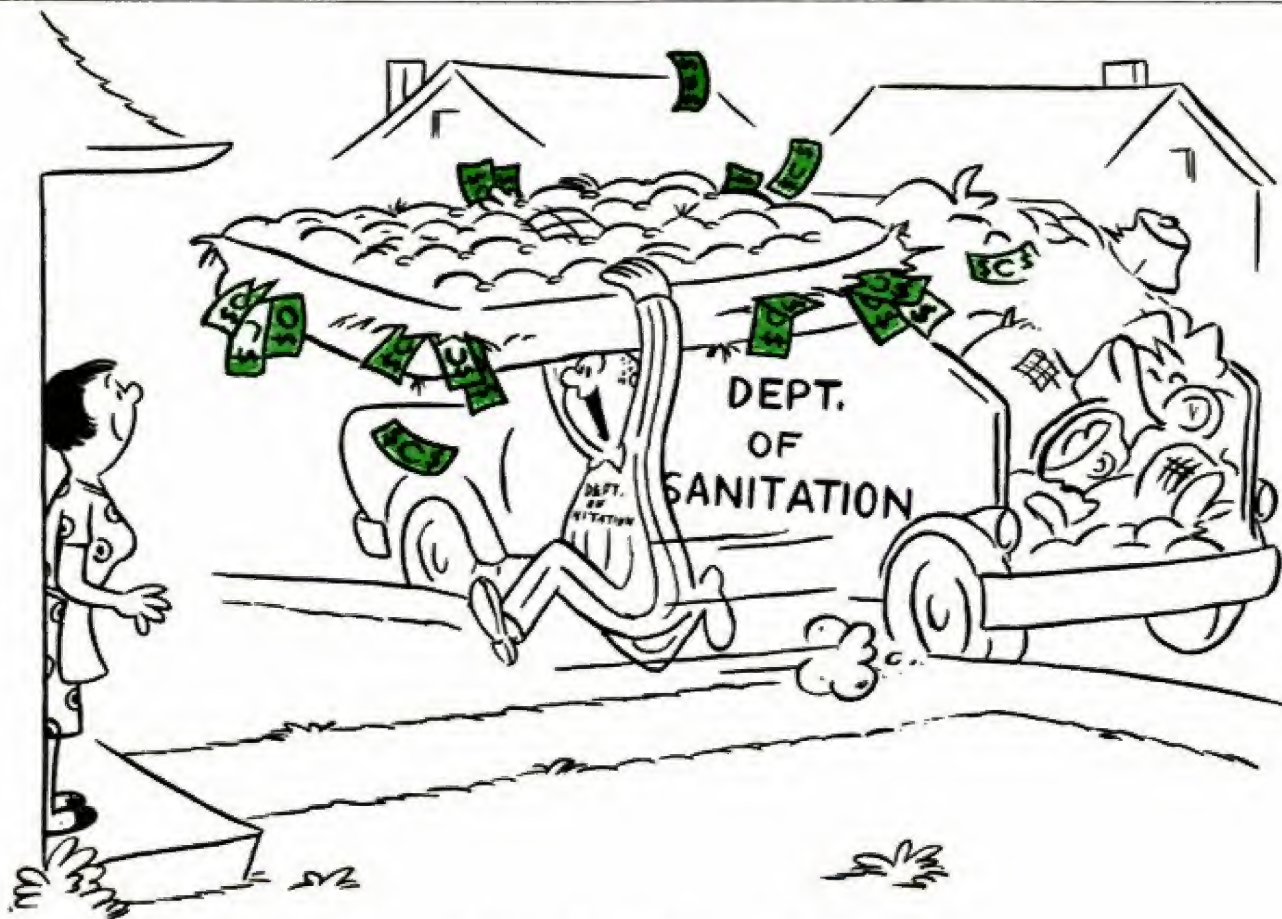
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# Udall, Kansas — City on the Alert

**By Robert Pearman**

Everything's up-to-date in Udall, the small Kansas town that in 1955 was virtually blown from the face of the earth by a tornado. Today it is the safest city in the U.S.—the community best prepared to meet disaster or nuclear attack.

All 644 residents have shelter from wind or radiation; 100 visitors could also find haven. In addition to private shelters, the two churches and the grade school have shelters that could house a large segment of the community; primarily they are for tornado protection, but they would give good fallout protection, too.

Udall was not always so well prepared. On the night of May 25, 1955, the air grew strangely tense and still and the sky turned ominously dark. Then the tornado struck. In less than one minute the destruction was complete. One-sixth of the population was dead. Only one house in Udall was standing. The telephone operator was buried beneath her shattered switchboard; power lines were a hopeless tangle. Not even a car was left in running condition so survivors could go for help. There was doubt the town would rise again, but its people dug in. As they rebuilt, they made sure that night of horror would never be repeated.

Not only did they prepare against tornadoes, which occur frequently in the area, but against nuclear attack as well.

Family shelters were built, costing from \$450 to about \$3000. Church shelters, costing a great deal more, are equipped to provide food and toilet facilities; the school shelter can protect 150 people from fallout and has an emergency generator as an auxiliary power supply.

From mid-April to mid-June, the tornado season, Civil Defense unit members and town police act as spotters. They drive the roads to the southwest, in the direction of "tornado alley," and keep eyes on the storm-streaked sky. If they spot something, they blow a siren, alert headquarters, and a telephone relay is under way.

Udall has 22 volunteer firemen, 8 auxiliary policemen, 30 people trained in first aid, 75 trained in mass feeding and four have radiological training to run a fixed monitoring station. The line of succession for the office of mayor has been set.

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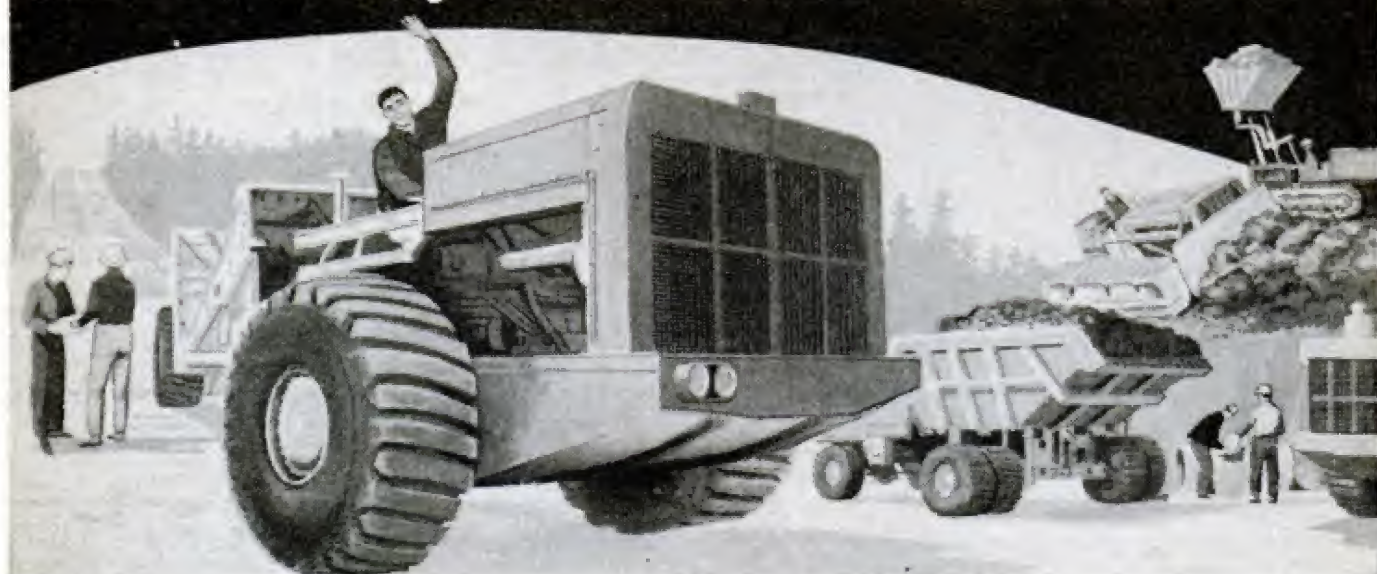
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**SAVE 50 To 100%.** Portable transistor tape recorders, FM, stereo, radios. P.O. Box 2404, Memphis 2, Tenn.

**SAVE 30%** stereo music on tape. Free bargain catalog, blank tape, recorders. Norelco speakers. Saxitone, 1776 Columbia Road, Washington, D. C.

**SINGLE** Transistor 45 minute timer. Information 25¢. WIYY, Groton, Mass.

**LEARN** While asleep with amazing "Electronic Educator" endless tape recorder. Details free. Research Association, Box 24-PX, Olympia, Wash.

**GOVERNMENT** Surplus radios, parts. Picture catalog 10¢. Meshna, Malden 48, Mass.

**FIX** Your own TV. Save 80%! Send for free illustrated chart showing how! We'll include giant electronics catalog. Zalytron, 220-M West 42 St., New York City.

**TAPE** Recorders hi-fi components. Sleep learning equipment, tapes. Unusual values. Free catalog. Dressner, 1523M Jericho Tpke, New Hyde Park, N. Y.

**SAVE** Dollars on radio, TV-tubes, parts at less than manufacturer's cost. 100% guaranteed! No rebrands, pulls. Request bargain bulletin. United Radio, 1000-M, Newark, N. J.

**TAPES**, 1200' 99¢; 1800' \$1.29. Free catalog. Box 3095, Philadelphia 50.

**MONEYMAKER**, Hi-fi dealers and technicians. Full details. No obligation. William N. Greer Associates, Fifth Floor, Imparcial Building, San Juan, Puerto Rico.

**DON'T** Buy Hi-Fi components until you get our low, low quotation. We guarantee "We Will Not Be Undersold." Easy-payment. Send 10¢ for wholesale catalog and best buy Hi-Fi list. Hi-Fidelity Center, 220-M E. 23rd St., New York 10, N. Y.

**TELEVISION** Tuners rebuilt. Western Tuners, 3040 West Sunset Blvd., Los Angeles 26, Calif.

**PORTABLE** Taperecorders with same features as other American name brands, but at new low price of \$29.95. No c.o.d. Floyd Stanford, Box 124, Lawtell, La.

**FROM** Japan direct to you at big savings! Two station intercoms \$8. Telephone amplifiers \$8. Portable transistorized tape records \$16. Portable eight-transistor, two-band radios \$18. Six-transistor pocket radios \$10. Six-transistor automatic radio-alarm clocks \$17. Two-transistor pocket radios \$5. Matchbook size two-transistor radios \$5. Same combined with cigarette lighter \$6. Everything complete with accessories. All name brands. Money-back guarantee. Postage prepaid. Reference: Bank of America, American Chamber of Commerce, Tokyo. Air-mail check, money-order to Security Enterprises, Ltd., Dept. C, 201 Fukoku Building, Chiyodaku, Tokyo.

## BUSINESS OPPORTUNITIES

**FREE** "Franchise Profit Letter" tells how unique NFR service is helping thousands seeking profitable businesses. Write today. National Franchise Reports, W-528, 333 North Michigan, Chicago 1.

**START** Your own business on credit. Your own boss, 1199 dealers sold \$5,000 to \$25,500 in 1961. We supply stocks, equipment on credit. 300 home necessities. Sales experience unnecessary. Pleasant, profitable business backed by world-wide industry. Write Rawleigh, Dept. H-U-PPM, Freeport, Ill.

**MAKE** Telephone surveys spare time! Free home-business details. No selling, choose your own hours. Telephone Institute, Dept. HC178, 1038 So. La Brea, Los Angeles 19.

**LEARN** Landscaping and the growing of plants. Start a profitable business part or full time. Free information without obligation. National Landscape Institute, Dept. MC-82, 11826 San Vicente Blvd., Los Angeles 49, Calif.

**EXPORT-Import** opportunity, profitable, world-wide, mail-order business from home, without capital; or travel abroad. Established world trader ships instructions for no-risk examination. Experience unnecessary. Free details. Mellinger, D708, Los Angeles 25.

**BIG** Money—Operate your own fix-it shop. Service all household appliances: irons, fans, refrigerators, automatic washer-dryers, etc. Do house wiring, commercial writing. Rewind motors of all sizes. Sharpen mowers, skates, saws. Buy needed spare parts wholesale. Free book. Christy Trades School, A-2803, 3214 W. Lawrence, Chicago 25.

**DOLLS!** Dolls! Dolls! We teach you to make, repair, dress and sell. Study at home. Earn while learning. Free booklet. Doll Hospital School, Studio MC-82, 11826 San Vicente Blvd., Los Angeles 49, Calif.

**CIGARETTES** 8¢ a pack. New amazing device. Guaranteed. Send \$1.00. Agents wanted. Zippo, 2632 30th Ave., Minneapolis, Minn.

**MANAGE** Motel or resort. Men, women, couples can make \$400 to \$1,000 monthly plus apartment. Pick own location with our employment assistance. Learn at home. Free booklet. Motel Managers Training School, Dept. PMC-82, 612 So. Serrano, Los Angeles 3, Calif.

**SELL** Greeting cards. Make extra money. Christmas, all occasion assortments, stationery, gifts, jewelry, name imprinted Christmas cards. Experience unnecessary. Salable samples on approval. Free catalog. Write Hedenkamp, 361 Broadway, Dept. PM-79, New York.

**START** A business spare or full time immediately repairing small electrical appliances. Free literature. M & L Appliance Parts, Dept. A, 1507 W. 69th St., Chicago 36, Illinois.

**MAIL-ORDER** Home business. Get free copy. "Make Money in Mail Order." Mailco, 1554 S. Sepulveda, Dept. D708, Los Angeles 25.

**10,000 PROFITABLE** Formulas, recipes, trade secrets. Details free. Colen, 7731-M8 Yates, Chicago 49.

**SPECIALIST** in high profit items. Our guaranteed sales plan means refund on goods you do not sell. Details included on how to sell 17 pc. S.S. Cookware with brochure showing \$149, your cost \$26. No canvassing. Other items. Davis Dist., 587 Springfield Ave., Newark 3, N. J., Dept. P.

**BECOME** Tax consultant. Graduates earn \$1,000-\$3,000 every tax season preparing returns evenings. State approved. Union Institute, Lakewood P-2, N. J.

**AMAZING** New home plastics business! Up to \$10.00 hour if you qualify. Pleasant, easy. No selling. Secrets revealed in free plan. NPC, Box 23321, Los Angeles 23.

**MAKE** Extra money. Big steady earnings, repeat business. Sell advertising book matches, full or part time. New 1962 line. Show glamour girls, colorama, tenoramas; dozens more. All sizes. Free master outfit, sales helps, leads, no experience necessary, no investment. Write today. Superior Match, Dept. MX-862, 7530 Greenwood, Chicago 19.

**BUSINESSES**, Resorts, motels, investment property, ranches. Our special service dept. at your disposal. No obligation. World's largest, 62 years service. Strout Realty, 7-MB S. Dearborn, Chicago 3, Ill.

**SELL** Books by mail. Moneymaking system. Amazing profits. Details free. American Distributors, Box 409, Niles, Michigan.

**IMPORTANT** "Newsletter" for mail-order beginners. Absolutely free. Neil H. Tasker, Shamokin, Pennsylvania.

**EARN** \$10,000 Selling books by mail. Box 51-BY, Des Plaines, Ill.

**OPERATE** Mailorder bookshop. Free details. Ballard, 1834 Edgeland, Louisville 4, Ky.

**CARPET** Layers earn \$1000 monthly. Easy home training. Big demand. Write Carpet Crafts, 7625 Melrose Avenue, Los Angeles, California.

**"HOW** To Build Your Own Mail Order Business." Don't experiment. Avoid pitfalls with this book as your tested guide. 50¢. Specialty Service, Box 540, Tacoma 1, Washington.

**MAKE** Money making leathersgoods. 1143 ideas. Free information. Tandy Leather Co., Box 791-Q3, Fort Worth, Texas.

**MOLDING** Rubber, shells, flowercraft. Free information. Chaney's, 5415-A San Jose Blvd., Jacksonville 7, Fla.



**OPERATE** Own collection agency. Spare time extra cash: Satellites, Box 172PM Manhattanville Station, New York 27, N. Y.

**IMMEDIATE** Profits with no capital or experience. Take orders for all magazine subscriptions. Friends and neighbors are your prospects. Write now for complete, free kit. McGregor Magazine Agency, Dept. CB2, Mount Morris, Illinois.

**HOW** And where to obtain capital. Reliable Service, Rome City, Ind.

**SELL** Champion, AC. Autolite spark plugs. Reconditioned, electroplated, guaranteed 10,000 miles. 100% profit. Free sample. Lee Plugs, 1608-A Roberts, Houston 3, Texas.

**VENDING** Machines. No selling. Operate a route of coin machines and earn amazing profits. 32-page catalogue free. Parkway Machine Corporation, Dept. #27, 715 Ensor Street, Baltimore 2, Maryland.

**BIG** Money raising fishworms and crickets. Free literature. Carter Farms, Plains, Georgia.

**TO \$100.00 Weekly.** Sparetime, home operated mailorder business. Successful beginner's plan. Everything supplied. Lynn, 10420-M National, Los Angeles 34.

**PIANO** Tuning learned quickly at home. Tremendous field! Musical knowledge unnecessary. Information free. Empire School of Piano Tuning, Champaign, Ill. (Founded 1935).

**COPUBLISH** Mail Sale Advertiser, leading mail order paper. Details, latest copy, dime. Vanroy Shirk, Lebanon, Penna.

**OPERATE** Profitable mail order business. Write Walter Service, 4159A East 112th, Cleveland 5, Ohio.

**BAKE** New greaseless doughnuts in kitchen. Sell stores. Free recipes. Montgomery, 3605 South 15th, Minneapolis 7, Minnesota.

**MAKE \$46** From square foot plywood: jigsaw necessary. Free details. Woodart, Bridgewater, Mass.

**\$400.00 MONTHLY** Raising giant fishworms. Soilless method. Charlie Morgan, Bushnell, Florida.

**PLASTERCRAFT** Molds, liquid rubber, plasters, flocks, candle supplies. Catalog and manual free. Blue Rapids Supply, Blue Rapids, Kansas.

**WORLD'S** Largest wholesale supply. Buy from 679 American, European, Japanese wholesalers. Tailormade suits from Hongkong. 123 dropship catalogs. Rock-bottom prices. Free details. International Buyers, 216-MM Jackson, Chicago 6, Ill.

**MANUFACTURE** Polishes, cleaners, cosmetics, anything. Literature, stamp. Nelko, 3462 Merchandise Mart, Chicago 54.

**EXCLUSIVE** Cosmetic franchise. 150% profit. Mail or locally. Leads furnished. Tré Beau, 4917-G Park Heights, Baltimore 15, Maryland.

**MAILORDER** Catalogs. No inventory required. Full profits. Operate from home. Send 25¢ for 32-page sample catalog featuring 150 unusual fast-moving products and complete details. Satisfaction guaranteed. Gaylords, North Adams 6, Mass.

**LARGE** Profits manufacturing national advertised products in home. Free information. Andrews, East 3823 Liberty, Spokane 27, Wash.

**11,000 NEW** Prospects daily. Baby record books, shoes, albums. Sell mailorder. Use our literature. Write: No-Co-Ro, Capitola, Calif.

**OPERATE** Home mailorder business. Vosacek Printing, 4444A Ute, San Diego, 17, Calif.

**COLORGLAZED** Concrete pottery made without molds. Patented method. Cemetery products, novelties, tiles. Basement leak-sealing. Money-making projects. Booklet, details free. Men only. National Potteries Company, Grand Rapids, Minnesota.

**WANT** To make big money at home? \$10.00 profit in an hour possible with invisible mending. Make tears, holes disappear from clothing, fabrics. Steady year-round demand from cleaners, laundries, homes. Details free. Fabricon, 1585 Howard, Chicago 26, Ill.

**EARN** Money raising fishworms for us! Write: Oakhaven—38, Cedar Hill, Texas.

**LEARN** Sewing machine repairing. To \$125 weekly. Sparetime. Supplies. Add to present business. Write today! Taylor Service, Box 484, Cupertino, Calif.

**MAKE** Money from old tires. Operators clearing \$400 weekly. Equipment costs \$800. Get facts. S & S Patents, Inc., 3511 N. Lincoln, Chicago 13.

**DRIED** Mushrooms \$4.50 pound for large canning company. Receiving warehouse in United States. Growers wanted on contract, everything supplied. Dehydrated Products & Chemicals, No. 548, Calgary, Alberta, Canada.

**VENDING** Machine catalog. Rakes, 609P Spring Garden, Philadelphia 23, Penna.

**LEARN** To sharpen, repair, and service lawn mowers, also straighten crank shafts intact. Wirt's, 2419 Gnahn, Burlington, Iowa.

**BRONZE** Baby shoes. Genuine electroplating process. Equipment, mountings, instructions. Send \$1.00 for valuable book "Your Guide To Success" bronzing baby shoes, plus complete catalog. Hollywood Bronze Supply, Dept. B60, 3445 Union Pacific Avenue, Los Angeles 23, California.

**RAISE** Rabbits on \$500 month plan. Free details. White's Rabbitry, Mt. Vernon, Ohio.

**\$200.00 MONTHLY.** Spare time. With tablesaw, bandsaw or jigsaw. Write. Holiday House, A3800 Harney, Vancouver, Washington.

**SHARPEN** Saws and lawnmowers the profitable way. Send for free literature. Max Manufacturing Company, 138 Stockton Avenue, San Jose 26, California.

**AMAZING** Profits in exterminating. Full time, part time. Free details. Baylab 21-M, Cambridge, Maryland.

**SIMPLE.** Pleasant mailorder can net \$12,000 year. Write: Rutward, 2010 Bryant, Columbia Station, Ohio.

**\$34.70 TWO** Hours manufacturing concrete products. No selling. Castings #3, Box 1721, Rapid City, South Dakota.

**NOW!** Amazing home mail order business. Details. Kukitz, 369 Spruce St., Coplay, Penna.

**SOURCE** List directory. The discount buyers friend. Price \$1.00. Buyers Service, 3702 Aurora, Indianapolis 27, Indiana.

**LAUNCH** Profitable mailorder business. Write: Kozar, 159 Belleville, Belleville, N. J.

**GARDEN** Golf. Start amusement center. Invest now. Brockway, Box 3762, Portland 8, Oregon.

**FABULOUS** Profits, assembling ming trees, driftwood planters, wallpieces. Materials furnished. Free information. Murray, 731 Crain St., Carson City, Nevada.

**PACKAGE** At home for profit! We supply everything. No selling. Free home business details. HPC 2212BR, Jesse Street, Los Angeles 23.

**FREE** International trade bulletin. Drop-shipment information. ITIS, Box 454, Hollywood 28, Calif.

**MANUFACTURE** Products. 400% profit. Sell mailorder. Catalogue free. International, 6347 Parnell, Chicago 12, Illinois.

**DO** It with "Floating-Henryburgers." 75 million sold. Send only \$2.00 for proof—sample materials. P.O. Box 926, Wichita, Kansas.

**LARGE** Profits manufacturing, selling own brands. Andrews, East 3823 Liberty, Spokane 27, Wash.

**EVERYBODY** Likes fine candy and popcorn specialties. Make professionally home. (Our 50th year.) Ragsdale Candies, B107 East Orange, New Jersey.

**PROFITABLE** Mailorder business! Write: Vikari, 463-P Third Avenue, Salt Lake City 3, Utah.

**\$200.00 WEEKLY** Sparetime. Franchise. Free samples. Box 974, Adelaide, P.O., Toronto, Canada.

**IMPORT—Cuckoo** clocks, watches. 160% profit! Plans free. Victor, Box 944-A, Kingsport, Tennessee.

**\$7500 YEARLY** Operating mailorder or wholesale business. Free details. Coats, Box 1247A8, Ontario, California.

**MAKE \$1,858.50** Yearly with \$89.95 investment. Yearly contracts. Hubbard, 3757 Wilshire, Los Angeles 5.

**INVEST** In new coins. 2500% profit. Box 65-D1, Highland Park, New Jersey.

**ATTENTION** Nutria purchasers. Be associated with the only organization in North America which offers you a known pelt guarantee. Yes, here is your pelt market with guaranteed floor price on all pelts. For free book (on how to raise nutria) write to Canadian Nutria Limited, R.R. 2, Stouffville, Ontario, Canada.

**MAKE** Stepping stones. Quickly! Inexpensively! Crabtree, 11025 Jefferson, Newport News, Virginia.

## MONEYMAKING OPPORTUNITIES

**MAKE** Big money raising fishworms. Free information. Downeast, Box 149, Bangor, Maine.

**EASY** To start rubber stamp business at home in spare time. Make up to \$9.80 an hour without experience. Facts free. Write Roberts, 1512 Jarvis, Room CR-2-H, Chicago 26.

**MEN—Women!** Start money-making plastic laminating business at home in spare time. Material that costs 11¢ brings back \$2.58. No canvassing or selling but mail orders brings in \$20 a day. Write for full particulars free. Rush name on postcard to Warner, Room CL-2-H, 1512 Jarvis, Chicago 26, Ill.

**BECOME** A notary public! Win extra income, prestige, business contacts. Details free. Stationers Exchange, Box 552-P, Kermit, Texas.

**EARN** Money evenings, copying and duplicating comic cartoons for advertisers. Adservice, Argyle 1, Wisconsin.

**MAKE** Plastic novelties for extra income. Low cost home training now available. Write for free booklet. Interstate Training Service, Dept. D-3, Portland 12, Oregon.

**BAKE** New greaseless doughnuts in kitchen. Sell stores. Free recipes. Melvin, 3605 South 15th, Minneapolis 7, Minn.

**CIGARETTES—Make** 20 plain or filter-tip for 9¢. Facts free. Moberly, Box 4012, Owensboro, Kentucky.

**MINK** Raising information free. Complete. Lake Superior Mink Farm, Superior, EE1, Wisconsin.

**VENDING** Machines. No selling. Operate a route of coin machines and earn amazing profits. 32-page catalogue free. Parkway Machine Corporation, Dept. #26, 715 Ensor Street, Baltimore 2, Maryland.

**EARN** Money raising fishworms for us! Write: Oakhaven—59, Cedar Hill, Texas.

**YOUR** Own, easy-to-start, home mail-order business, sparetime. Fascinating! Profitable! Information free. Alfano, 19-PM Pine, Closter, N. J.

**BIG** Money raising fishworms and crickets. Free literature. Carter Hatchery, Plains, Georgia.

**AMAZING** Successes through franchises! Become exclusive franchise holder your territory. Information rushed. National Franchise Reports, MP-528, 333 North Michigan, Chicago 1.

**LEARN** The secrets of repairing junk batteries, generators, starters, profitable, easy, at home. Free particulars. Batterymen, 3465 Forrest, Santa Clara, Calif.



**LEARN** Jewelry making at home. Inexpensive art metalcraft course teaches how to make all types cuff links, earrings, tableware, etc. of silver, gold, copper. Send postcard for free booklet. Interstate Training Service, Dept. L-3, Portland 12, Oregon.

**MAKE** \$5,000 Yearly sparetime raising mink, chinchillas, nutria, etc. Free booklet reveals proved plans. Write: Furs, 583 Mt. Pleasant Road, Toronto 1, Canada.

**GROW** Miniature dwarf trees in your home. Proven process. Fully explained in detail. Send \$3.00. Dwarf Trees, Box 309, Akron, Ohio.

**THE CRUCIFIXION:** cast in marblerock—finished in gold. Weight 1 1/4 lb. Height 5 1/2". Retail \$2.00 each. Wholesale \$7.00 doz., ppd. Sample \$1.00. Hall Gift Products, 119 S. Calverton Road, Baltimore 23, Maryland.

**YOUR Own** profitable import business. African curios drop-shipped direct to you. Price list, pictures, complete shipping information \$1.00. Weslyn Supply Co., 35 Hood St., Lynn, Mass.

**START A** profitable subscription business in spare time! We need men and women (young and old) as representatives for all leading national magazines. Liberal commissions on all subscriptions. Supplies free. No experience needed. Send this ad with your name and address to: Popular Mechanics, Room 8-O, 250 W. 55th St., New York 10, N. Y.

**EXCELLENT** Money-making offer! Write: Information Service, 650A Jasper St., San Jose 27, Calif.

**10,000 FORMULAS.** Trade secrets. 882-page catalog. Details free. P.O. Box 25, Higbee, Missouri.

**WANTED** Sales and service operatives. Creditors Service Company. Murphy, North Carolina.

**FREE Book:** "609 Unusual, Successful Businesses." Box 1001-PW, Evanston, Ill.

**MONEY-MAKERS.** Increase your income from home. Free tested and proved information. HARFAM, Box 775200, Los Angeles 7, California.

**"101 PROVEN** Ways to Make Extra Money." Dozens of things you can do yourself, full or spare time. Make a hundred times its cost. Only \$2.00 postpaid. Results guaranteed. Proven Methods, Box 12673-A, Tucson, Arizona.

**SPARETIME** Occupation. New printing method. Experience unnecessary. Huge profits. Dalton, 5922 Metro. Sta., Los Angeles 55, Calif.

**CHARCOAL.** Starter, heater. \$4.49. Salesman, wholesalers. Box 231, Marshalltown, Iowa.

**PRACTICAL** Mail order. Start small. Money-maker, 722-P8 East Silver Spring, Milwaukee 17, Wisconsin.

## EXPORT — IMPORT

**WHOLESALE** Transistor radios: Mail self-stamped envelope. Gonzalez, 3100 Gaston, Dallas 26, Texas.

**JAPAN:** Direct mail-order 26 page catalogue: dolls, novelties, business information, manufacturers' names, addresses, \$1.00; Japan's Trade Directory, 3000 companies, \$3.00. Send cash. Clarence Yamagata, 814 Toginbiru, Marunouchi, Tokyo.

## SCIENCE & CHEMISTRY

**ROCKET** Amateur supplies. Chemicals, engines, instruments. Big new catalog 25¢. Central Rocket Co., Waupaca, Wis.

**ROCKETS:** New illustrated catalog 25¢. Single and multistage kits, cones, engines, launchers, trackers, technical information, etc. Fast service. Estes Industries, Penrose 7, Colorado.

**CHEMICALS** And apparatus for industrial, analytical, and private laboratories. Catalog 35¢. Dept. M-50, Biological Supply Co., 1176 Mt. Hope Ave., Rochester 20, N. Y.

**ILLUSTRATED** Catalog: Chemistry, mineralogy, biology 25¢. Tracey Laboratories, Evanston, Illinois.

**UNUSUAL** Chemistry books, courses, kits! Rare chemicals, cheap! Catalog 25¢. NSC, Box 11133, Palo Alto, Calif.

**LABORATORY** Conversion charts with bigger catalogue—25¢. Hagenow Laboratories, Manitowoc, Wisconsin.

**30,000 CHEMICALS** In stock. Your order shipped today anywhere. Metropolitan Chemical, 21 W. 60 St., New York City 23.

**AMAZING** New book of science experiments, formulas, and catalogue of laboratory supplies. Only 35¢. National Scientific Co., 13 S. Park Avenue, Dept. PM-8, Lombard, Illinois.

## FORMULAS, PLANS, ETC.

**10,000 PROFITABLE** Formulas, recipes, trade secrets. Details free. Colen, 7731-MH Yates, Chicago 49.

**UNUSUAL** Formulas, home businesses. Write Southland, 401-C E. Jackson, Orlando, Florida.

**FORMULAS** For latest money-making discoveries. New! Good! Valuable literature free! Miller, Chemist, 1517-D, Tampa, Florida.

**FORMULAS—All** kinds. Amazing big catalog. 10¢. Kemixal, Park Ridge, Ill.

**LATE.** Modern manufacturing formulas. List free. Moon Chemical, Martville, New York.

## PLASTICS

**BOXES,** Plastic. 200 sizes. Free list. Altman, 170 Bar 23 Street, Brooklyn, N. Y.

**NEW** Liquid casting plastic, clear, colors. Embed real flowers, butterflies, photos, coins. Send 25¢ for two handbooks. "How to Cast Liquid Plastics" and "How to Make Extra Money at Home." Castolite, Dept. J-101, Woodstock, Illinois.

**AMERICAN** Plastic laminating presses. Finest, fastest for exciting new business. Highly profitable. Terrific demand. American Machine Manufacturing, Box 1246, Savannah, Ga.

**FIBERGLASS** Handbooklet. Instructions, repair. \$1.00. Urshanair, Box 250, Santee, California.

**PLASTIC** Embedding and molding made easy with new Instruction Manual, \$1.00. Catalog 25¢. Castacraft Corp., Dept. M-862, P.O. Box 555, Palo Alto, Calif.

## AGENTS WANTED

**RUN A** spare-time greeting card and gift shop at home. Show friends samples of our new 1962 Christmas and all-occasion greeting cards and gifts. Take their orders and earn to 100% profit. No experience necessary. Costs nothing to try. Write today for samples on approval. Regal Greetings, Dept. 7, Ferndale, Mich.

**MAKE** Up to \$50.00 a day soliciting delinquent accounts. Terrific commissions. Write today. National Credit, 304Y Pickwick Bldg., Kansas City 6, Mo.

**YOUR Own** business—Used suits \$1.50; overcoats 65¢; mackinaws 35¢; shoes 12 1/2¢; ladies' coats 30¢; dresses 15¢. Enormous profits. Catalog free. Nathan Portnoy Associates, 2109-AA Roosevelt Road, Chicago 8, Ill.

**BIG** Profits. Stamp social security plates, key protectors. Sample 50¢. Catalog free. General Products, 11 No. Pearl St., Albany 7, N. Y.

**FREE** Sample. Beautiful curios! Sell on sight! Apartado 9036, Mexico City.

**PRINTING.** Advertising salesmen—Excellent money-making sideline selling decalcomania name plates, small quantities. Automobile initials, sign letters. Free samples. Balco, XL, Boston 19, Mass.

**AGENTS—300%** Profit selling genuine gold window letters; stores and offices. Free samples. Metallic Sign Letter Co., 1217-D West Newport, Chicago.

**BUSINESS** Kit free! Postcard puts you in business! Complete line 230 shoe styles, jackets! New discoveries pay big commissions. No investment. Send for free kit. Mason, Chippewa Falls K-435, Wisconsin.

**MAKE** Most extra cash with world's biggest line Christmas cards, wrappings, gifts. Introduce friends, neighbors to 150 Christmas, everyday box assortments, 600 big money-making novelties. Pocket up to 50% profit plus liberal bonus. Free giant color catalog; samples on approval. Arrow Greetings, 513 Fourth Ave., S., Dept. 33-S, Minneapolis, Minn.

**SELL** Greeting cards. Make extra money. Christmas, all occasion assortments, stationery, gifts, jewelry, name imprinted Christmas cards. Experience unnecessary. Salable samples on approval. Free catalog. Write Hedenkamp, 361 Broadway, Dept. PM-78, New York.

**AEROSOL** Products—automotive, household, Christmas snow. Exceptional profits. Jell Associates, Rockledge, Philadelphia 11, Penna.

**BEAUTIFUL** Feather pictures! Free details. Sample 20¢. Apartado 1668, Mexico 1, D.F.

**CHRISTMAS** Cards. Earn bigger commissions with this exceptional line. Price range: \$4.75 to \$14.25 for 25 cards, with customer's name imprinted. Album contains 85 personal and business designs that are "different." Inexperienced salespeople can earn up to \$600 and more this season, even in spare time. Experienced Christmas card salespeople can earn up to \$1,800 from now 'til Christmas. Sales kit includes expensive sample album and easy selling instructions. If you want really big commissions from this higher-priced line, send for kit now! Write Process Corp. (our 41st year), Dept. Y-1, 3450 S. 54th Ave., Chicago 50, Illinois.

**APPLIANCES,** Cameras, radios, toys, typewriters, watches. Large coded wholesale catalogue! The Robinson Co., 15468 Hiway 80, El Cajon, Calif.

**CHRISTMAS** Cards wholesale. Take orders and earn up to 160% profit. Samples on approval. Write Astra Enterprises, 31868 6th Ave. S.W., Federal Way, Washington.

**REAL** George hot dog slitter. It's new, all you do is twist it thru—then barbecue, boil, broil. Sell \$1.00. Samples 2 for \$1.00. Circumscribe your hot dogs. George T. George, 4447 Simpson, North Hollywood, Calif.

## BUY IT WHOLESALE

**LARGEST** Wholesale supply source in U.S.! 15 free catalogs. Furniture, clothing, appliances, housewares, tools, sporting goods, hobby supplies, farm equipment, imports, new products, bargain merchandise. Free details. Associated, Box 108-DD, Lincoln 1, Nebr.

**HANDMADE** Western boots. Free catalogue. Sellers Co., 8830 Alameda, El Paso, Texas.

**SAVE** To 70%. Five free factory catalogs, tools, machinery, ladders, paint, brushes, wood screws, etc. Send 25¢, cost of handling. Factory Outlet, P.O. Box 172-PM, Norwalk, Conn.

**100,000 PRODUCTS** Wholesale! Terrific bargains! Wholesalers, 1265-M Broadway, New York 1, N. Y.

**GARDEN** Rotary tiller and tractor combination. Universal Mfg. Co., 324 West Tenth, Indianapolis 2, Indiana.

**BUY** Direct from factories! Appliances, cameras, watches! Free details! Cam Company, 436PA Bloomfield Ave., Verona, N.J.

**WORLD'S** Largest wholesale supply. Buy from 679 American, European, Japanese wholesalers. Tailormade suits from Hongkong. 123 dropship catalogs. Rockbottom prices. Free details. International Buyers, 216-M Jackson, Chicago 6, Illinois.



**NEW** Deluxe below wholesale catalog. Automobile catalog and others. Furniture, clothing, housewares, appliances, refrigerators, freezers, washers, dryers, television, radios, luggage, binoculars, hi-fi, stereo, phonographs, recorders, cameras, projectors, musical instruments, sporting goods, toys, tools, typewriters, watches, jewelry. Huge discounts on thousands of name brand items. For free specimen list of actual factory prices—postcard: Selbyco, Decatur 15, Illinois.

**FREE!** Name brands catalog! Your own high profit business. Sell name brands, full or part time. No inventory, no investment. More than 2,000 name brand items; lowest wholesale prices. Watches, jewelry, cameras, hi-fi, stereo radios-phonos, appliances, housewares, hardware, power tools, luggage, musical instruments, garden equipment, sporting goods, toys, many others. 8 floors of name brands. Million dollar inventory. Orders shipped complete in 24 hours! Send for free, beautifully illustrated catalog now! Separate wholesale price list. H. E. Davis Corp., Dept. PM, 145 W. 15 St., New York 11, N. Y.

**USED** And new watches \$2 up. Free list. Southern Watches, 5-PM So. Wabash, Chicago 3.

**ELECTRIC** Guitars, amplifiers, wholesale. Free catalog. Carvin PMW, Covina, Calif.

**SADDLES**—Western, English, guaranteed Ropers, \$58.00, \$75.00. Catalogue, \$1.00 refundable, 169½ Woodvale, Houston, Texas.

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**A Career Guidance Editorial—SKILLS for AMERICA**

# Growing Opportunities for Professional Draftsmen

*by B. Richard*

The growth of scientific and engineering occupations is bringing about an increasing demand for qualified draftsmen, whose job it is to translate engineers' calculations into practical, usable plans for the constructing or manufacturing of a particular product.

It is the job of the professional draftsman to convert the specifications, rough drawings or field notes of an engineer, architect or designer into scaled drawings which can be used by skilled craftsmen in making the desired object, whether it be an airplane, house, ship or any one of the thousands of products produced by industry.

Highly-qualified draftsmen, generally referred to as senior draftsmen or design draftsmen, must have enough background in engineering so that they can accurately draw an engineer's specifications. They are sometimes required to calculate the strength, quality or cost of materials used in final construction, and they must have

enough shop experience so that they can explain the plans to the craftsmen who make the final product and tell him just what procedures to follow.

Senior draftsmen can do much more than ordinary mechanical work. They sometimes do their own independent designing, and trusted senior draftsmen can be called upon to start and complete projects from their inception to the production line.

Detailers are draftsmen who expand on the layouts prepared by the design draftsmen. Detailers prepare working drawings of details or parts of the product to be manufactured. This is a job requiring experience, care and a great deal of training.

The profession of drafting requires responsible, highly-skilled men, and the pay of these men increases as they increase their training and job experience. In 1958, draftsmen in supervisory positions made up to \$8320 in a year's time, and even junior draftsmen earned up to \$91 weekly.



A good way to get training in drafting is through a technical institute or correspondence school. Technical institutes, offering resident training, have the advantage of giving you practical classroom and laboratory work under the supervision of a qualified instructor, and correspondence training enables you to learn the skills and techniques you need without interrupting your present job.

If you are man with family responsibilities, you could find correspondence training in drafting extremely helpful in opening up a new career. You will be able to set your own classroom hours and your work will be graded and corrected by your instructor. The correct solution to your lesson will be returned in the mail so that you can profit by your errors.

A technical resident-training institute is ideal for a man who is able to devote more hours during the day to instruction. Many who take their training in this way work in the evenings to defray costs. This method will probably give you a shorter period of training because you will get more instruction in a day's time.

It is possible to become a draftsman after serving a three to four-year apprenticeship, and, in some areas, this might be a requirement even after a period of school training. The apprenticeship program without additional school training has the disadvantage of not offering instruction in mathematics and the physical sciences—important instruction for more highly-skilled drafting positions.

The employment outlook for draftsmen is expected to be good throughout the 1960's with continued expansion of employment opportunities in the long run. With the increasing complexity of industrial operations, design problems assume more importance and well-trained draftsmen will be needed more than ever.

In addition, industries that employ the most draftsmen are expected to expand. The government's defense and missile program, for example, has been increasing steadily in recent years and will be expanded even more if present indications hold out.

Department of Labor statistics show that there will be no increase in industry's demand for *unskilled* labor in the coming years. In fact, there will be an actual decrease. However, the demand for *skilled* workers such as draftsmen will increase as our industrial economy expands.

For your free copy of Popular Mechanics' career-guidance booklet, **SKILLS for AMERICA**, write Popular Mechanics, Department SFA, 200 East Ontario St., Chicago 11, Illinois.

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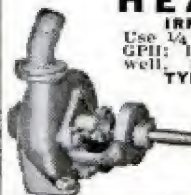
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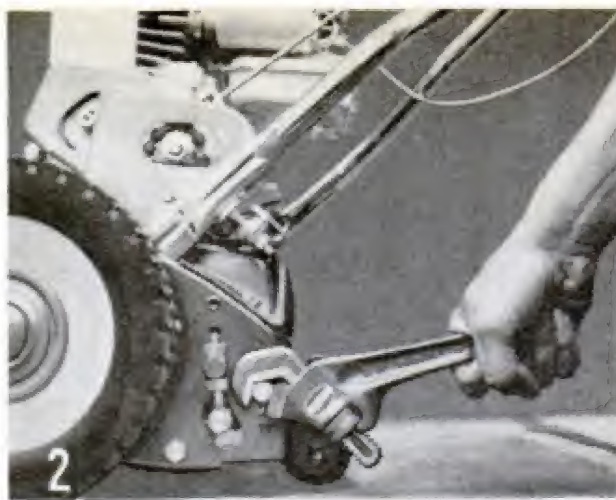
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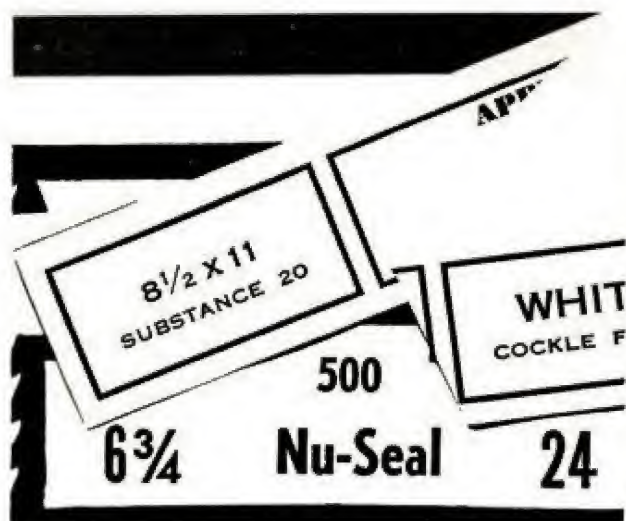
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## Spotlight on the Volvo 122S

By Jim Whipple

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It took us only a few minutes to discover that the Amazon is a useful and comfortable car—and more fun to drive than anything in a family sedan that we've seen in a long time.

What did take time was the business of analyzing its virtues, trying to find out why you volunteer to run errands for your wife when you could just as easily stay home and paint the screens of a Saturday.

After a week and some 800 miles, we felt that we had found the reason for Volvo's winning ways: It's been carefully designed to provide the quickest point-to-point transportation over the narrow winding, mountain roads of Europe.

The engine, for example, is more than just another European economy power plant designed to squeeze the most out of a nickel in city traffic, although *PM's* test car delivered 23.9 miles per gallon over-all.

Volvo's four-cylinder power plant develops 90 horsepower from just 108.5 cubic inches of displacement, which is efficiency comparable to U.S. engines after they've been through the souping-up process.

However, the Volvo's B-18 engine has a compression ratio of only 8.5 to 1 and will operate beautifully on regular grades of gasoline.

Like so many relatively small engines, the B-18 overhead-valve job must spin pretty rapidly to develop its power. Volvo puts out its peak horsepower at 5000 r.p.m.

In all too many European engines this high-speed output makes for some unhappy consequences: Excessive noise, annoying vibration and early exhaustion of overly busy parts such as valves, push rods and rocker arms. The Amazon's power plant, however, is a modern design with a short piston stroke of just 3.15 inches combined with a bore of 3.31 inches. For an idea of its relative size it's a little less than half the displacement of Buick Special's aluminum V8, and has just about half of that engine's top horsepower as it's installed in the Special.

The engine's low vibration level is due in part to a crankshaft with five main bearings which effectively stop bottom end vibration before it starts.

Efficiency of the B-18 engine in relation to its size stems from its dual SU carburetors, fully machined (for smoother gas flow) combustion chambers, and individual intake ports for each cylinder.

But what the engine does for the Volvo Amazon is the eye-opening part. Although the car weighs 2400 pounds it can be accelerated to 60 miles per hour from a standing start in a shade over 14 seconds. In this area it matches or even betters a number of U.S. six-cylinder compacts with engines 50 percent larger.

Cruising at 75 is not only possible but practical. Top speed is about 85 to 90, although (in American fashion) the horizontal, red band speedometer is lettered up to 120 m.p.h.

(Continued to page 64)





## Dual Wheels Help Small Trucks Tackle Big Jobs

Increased traction, stability and load capacity can be had by owners of small trucks who bolt on Dualmatics. These are steel flanges that mount between two sets of long studs to convert the rear wheels of  $\frac{1}{2}$ -,  $\frac{3}{4}$ - and 1-ton trucks to duals.

Sets are sold for most popular truck makes (\$49.95 to \$59.95 ppd.) by Dualmatic Prods., P.O. Box 419-M, Longmont, Colo. Most sets have optional fender extensions and need no wheel well cutting to accommodate reduced clearance due to the load.



"See, it not only wakes you up, but it sees to it that you stay awake."





**NEAT ITEM** for Scandinavian (or Midwestern) winters is the roller blind that shuts off radiator with the simple pull of a chain from the driver's seat

But in our opinion the outstanding feature of the Volvo is the truly excellent four-speed fully synchronized manual transmission. First of all, its ratios; 3.13 to 1 for first, 1.99 to 1 second, 1.36 to 1 third and 1 to 1 fourth, (coupled with a 4.1 to 1 rear axle ratio). These are ideal for sports car driving.

Maximum working speeds through these gears are 25 m.p.h. in first, 45 in second, 65-70 in third and 85 in top gear.

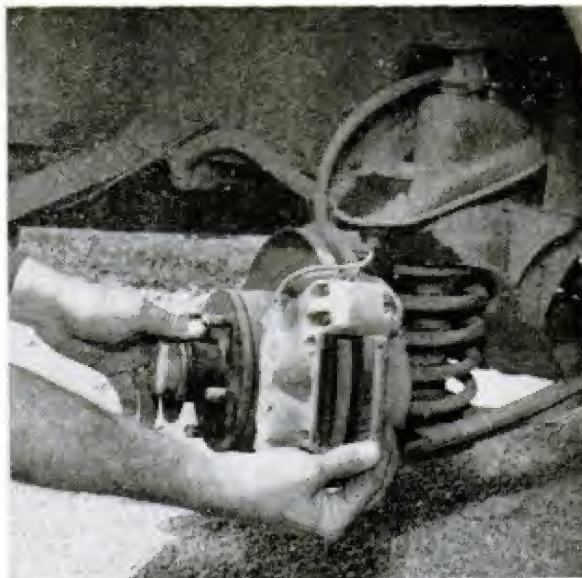
Shifting is by means of a long, floor-mounted lever that you might think would be loose and imprecise, yet the action is ideal for anything short of out-and-out racing, a nice compromise between the loose feel of some rear-engined imports and the stiff, balky action of some British sports jobs.

Coupled with the hydraulically actuated clutch this transmission is perfectly suited to mastery by any woman if she's willing to accept the idea of manual shifting at all. This shift is a pleasure to use; you can snick it from fourth to third as fast as a TV gunslinger draws, and the lively lady (after all the car's called Amazon) will sweep you around a semi on a two-lane road before you can say "Oldsmobile Eighty-Eight."

Steering the Volvo, via its solid, black plastic wheel and rack-and-pinion gearing, is as much fun as shifting its four-speed box. The car's weight is distributed so that you get just a shade of understeer—a nice balance to the quickish steering.

Beefy, caliper disk brakes on the front wheels are standard equipment. There's no power booster nor is there any need for one.

The Amazon's suspension system has no



**VOLVOS WILL STOP** as well as they'll go, thanks to the beefy disk brakes on their front wheels; "relining" takes less than five minutes per wheel

special gimmicks. Front wheels are independent with coil springs and ball-jointed spindles, while at the rear there are coil springs and a solid axle that's located by two torque links fore and aft and laterally by a track bar.

The ride is an ideal compromise between the firmly controlled action you'd want in a sports car and the softness that you appreciate on a long drive.

With the driver's long-term comfort in mind, Volvo has gone all out in giving him a near perfect seat. The driver's seat (and its mate) are not true buckets but have curved backrests for considerable lateral support. The backrests incidentally, are adjustable for three positions of tilt.

The seats move about five inches forward and back—far enough to give comfort to long-legged six footers. But the real plus feature is that the entire subframe or track on which the seat slides may itself be adjusted. For permanent elevation you may select one of three settings.

Upholstery is plastic of good quality on top of firm foam rubber. You sit high in both front and rear seats, and vision is very good because the car itself is high. There's eight inches of clearance beneath the center of the car—evidently the rutted, icy back roads of Sweden demand a car that doesn't drag its belly pan. This feature should make the Volvo ideal for hunters and fishermen who travel the logging trails.

The Amazon is generously endowed with such standard equipment as heater-defroster, rear-seat center arm rest, cigar lighter and even a chain-controlled radiator blind at no extra cost.

At \$2595, we think the Amazon worth every penny. ★ ★ ★



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made with aluminum powders  
from **ALCOA**



## Fix it? Say Met-L-it

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# PRE-IGNITION

**can  
do  
this  
to  
your  
car!**



Look what can happen when combustion gases leak around the spark plug center-wire or between the insulator and shell, causing pre-ignition! Such leakage is prevented in AC Fire-Ring Spark Plugs by the copper-glass seal between center electrode and insulator, and by the heat shrink bonding process between insulator and shell.

Pre-ignition, due to combustion gas leakage, may also result from loosely installed spark plugs. Fouled or burred threads and failure to use new gaskets are common causes of loose installation.

For expert advice on pre-ignition problems,

see your AC dealer. He will recommend the right type of spark plug for your kind of driving—and will make sure they are correctly installed. Best way to guard against pre-ignition is to ask for AC Fire-Ring Spark Plugs.

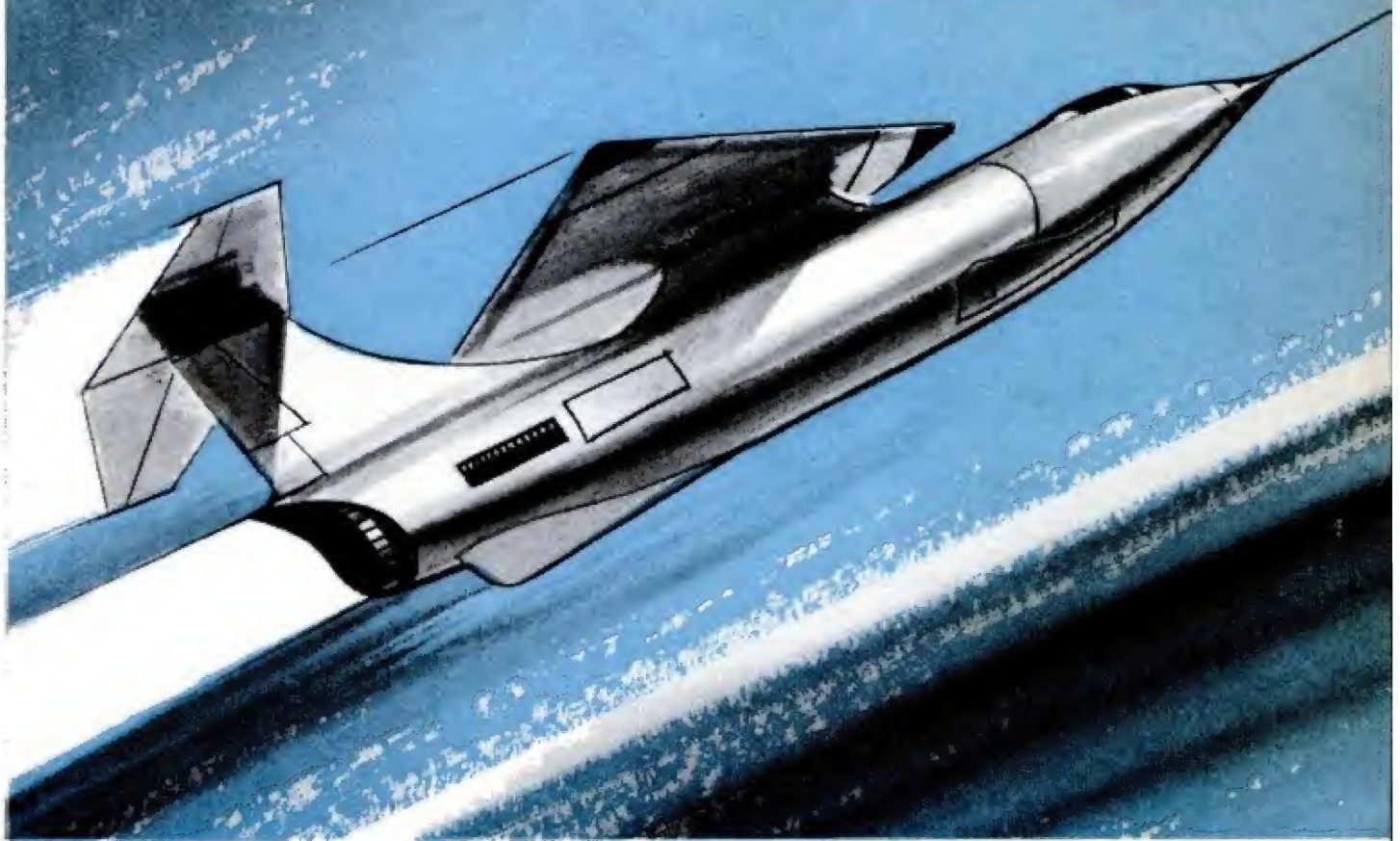


**FIRE-RING SPARK PLUGS**

AC SPARK PLUG  THE ELECTRONICS DIVISION OF GENERAL MOTORS

POPULAR MECHANICS





GIRARD 'HELIPLANE' features stubby delta wing that whirls for vertical takeoff, locks for cruising

## SUPERSONIC HELICOPTER

**O**NE OF THE newest concepts in aviation is a helicopter with a triangular rotor that converts into a fixed delta wing for fast straight-ahead cruising—at up to Mach 2, twice the speed of sound.

It is the only design that uses the same lifting device for hovering and cruising, yet transitions from one operation to the other while in flight.

This paragon of VTOLs hasn't yet been built, but its theoretical calculations look so promising that aerodynamicists have become intrigued by it.

The "heliplane" is the patented invention of P. F. Girard, project engineer of special projects at Ryan Aeronautical Co., San Diego, Calif. Pete Girard is an old hand at vertical-takeoff machines; he was test pilot for Ryan's spectacular X-13 *Vertijet* a number of years ago. He has served as chief aerodynamicist and also as chief of prelimi-

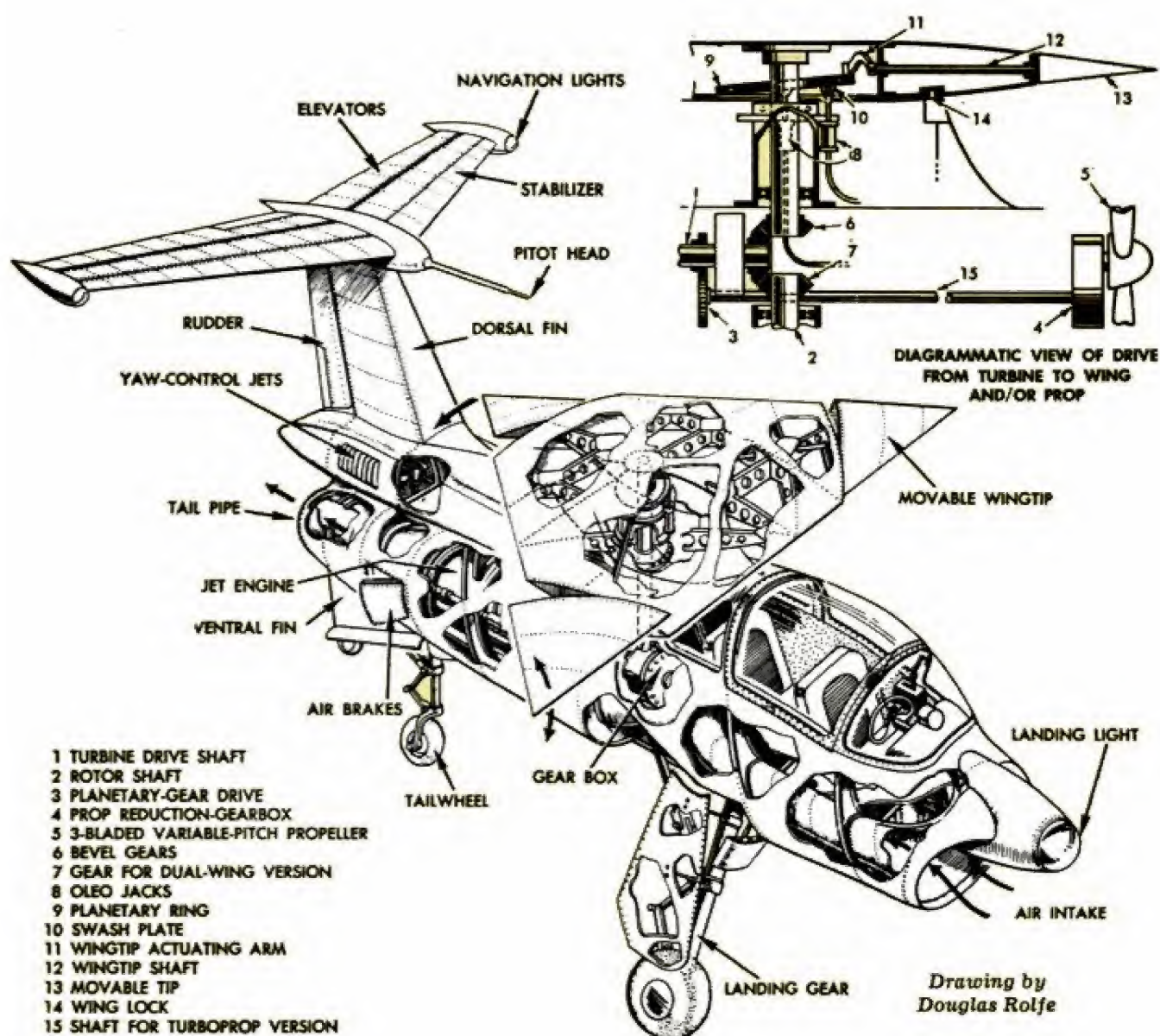
nary design on a number of Ryan projects.

His heliplane concept encompasses a whole family of designs ranging from a slow coaxial biplane to a supersonic military recon machine with a single overhead rotor-wing. This craft, with a fuselage resembling that of an F-104 and powered with a J-75 jet engine, would be capable of Mach 1.5 to Mach 2 speeds. It's shown above.

Included in the heliplane family are large subsonic and supersonic VTOL passenger transports having two or more rotor-wings mounted in-line above the fuselage. All would be powered by jet engines. To operate as a helicopter, the jet exhaust would be diverted to an auxiliary turbine that would drive the rotor shaft. All the designs with the exception of the turboprop biplane would use normal jet thrust for ordinary cruising.

Photographs on page 69 show two  $\frac{1}{20}$





scale models of a typical heliplane. It is a two-seater that would be powered with a J-60 engine of 3000-lb. thrust and would cruise at around 500 m.p.h. The full-sized craft would be about 40 feet long and its triangular wing would measure some 22 feet on a side. The craft's three-point landing system consists of two wheels that retract into the fuselage under the cockpit, and a wheel under the tail that retracts into the ventral fin that also helps provide stability.

One picture shows this craft as a biplane with one wing above and the other below the fuselage, an arrangement that contributes to dynamic stability. Another picture, with the lower wing removed, shows its appearance as a high wing monoplane. (As a monoplane the single rotor-wing would be somewhat larger than the one pictured.)

The tips of the three-sided wing are hinged so that they can be tilted to act as lifting surfaces when the wing is rotated. The tips are geared for both collective and cyclic pitch. Girard points out that most

of the lift from a helicopter's rotor is created by the outer portions of the blade, and that the heliplane follows this concept.

After lifting off vertically from the ground and climbing out at a steep angle, the pilot would transition to a fixed-wing configuration by diverting power from the rotor turbine and applying the power as tail-pipe thrust. The rotor would rapidly slow down and stop, automatically locking into delta-wing position. At the same time, the rotor tips would orient to zero angle and become part of the airfoil.

To land his craft, the pilot would descend to around 1500 feet, slow down almost to stalling speed and unlock the wing, allowing it to function again as a rotor and meanwhile applying the power to the rotor's turbine. Going from one configuration to the other or back again appears to offer no special structural or control problems. In case of engine failure the wing could be allowed to auto-rotate to let the craft down fairly safely.

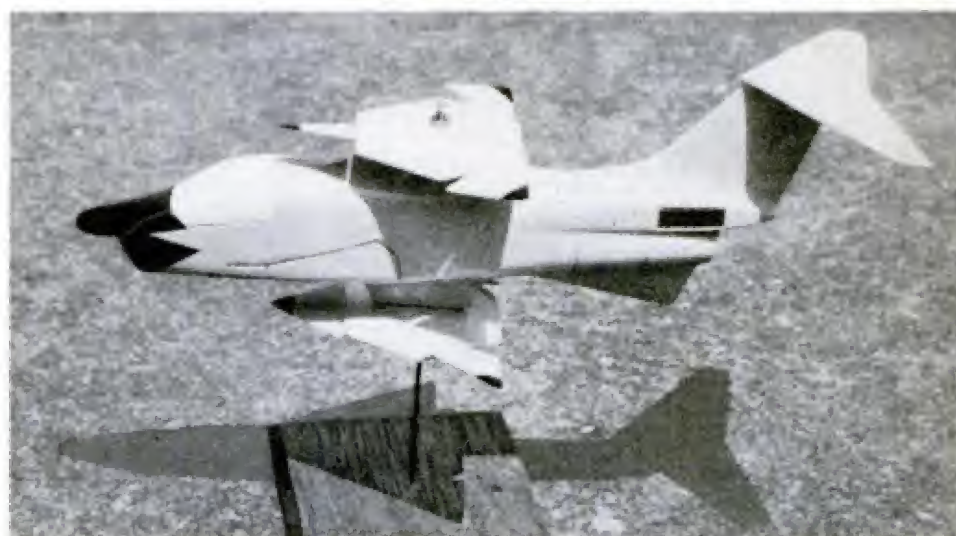
Most helicopters use a small tail rotor as an antitorque device, to prevent the fuse-



**CUTAWAY VIEW** (left) shows basic principles of heliplane. Unlike most VTOLs, it needs only one engine, including power for forward speed, whirling wing and yaw jets. Diagram in upper right shows how power is geared to wing or prop for turboprop version of heliplane



**PETE GIRARD** (right, above) holds model of single-wing version. Model of biplane version (right) shows wings above and below fuselage. They would whirl in opposite directions to counteract the effect of torque



lage from spinning with the rotor. Girard's biplanes need no such assist because the contrarotating upper and lower surfaces cancel out the effect. For his monoplane designs he would bleed off some of the jet gases through a side louver at the tail to counteract torque and also to provide directional control while hovering.

Girard's calculations show that the heliplane has a "figure of merit" of 75 percent as compared to 70 percent for a conventional helicopter. "When compared to many other types of VTOLs, the weight that can be lifted by this design appears to be very high in relation to horsepower," he says.

"Most VTOL designs have relatively high disk loadings, while the heliplane can be tailored to low disk loads. This provides good lift characteristics at the same time that the wing remains small enough for high forward speeds. This is an asset in the civil market where costs must be kept low."

As one part of the simplicity of his design, Girard points out that the heliplane requires only one gear box as against from three to fifteen in some VTOLs.

Another desirable feature is that the rotor-wing is of the rigid type. It's not hinged at the rotor head. The usual helicopter with a hinged rotor has a very narrow center-of-gravity range and its cargo must be stowed near this center of gravity. The rigid rotor, on the other hand, allows a wide latitude in center of gravity and a pilot can compensate for poor balance by adjusting the cyclic pitch. It's a safer machine.

All this sounds exciting, so when will the first heliplane be wheeled out for flight tests? It's hard to say.

All Girard's work so far has been exploratory. As this story was written, he was preparing to test the performance of his three-pointed rotor with a power-driven model. Patent rights have been assigned to Ryan Aeronautical, as is customary in industry.

If Girard's tests confirm his calculations, more research will follow. And, if all goes well with the research, it might not be too long before his unique idea for a heliplane becomes a reality!

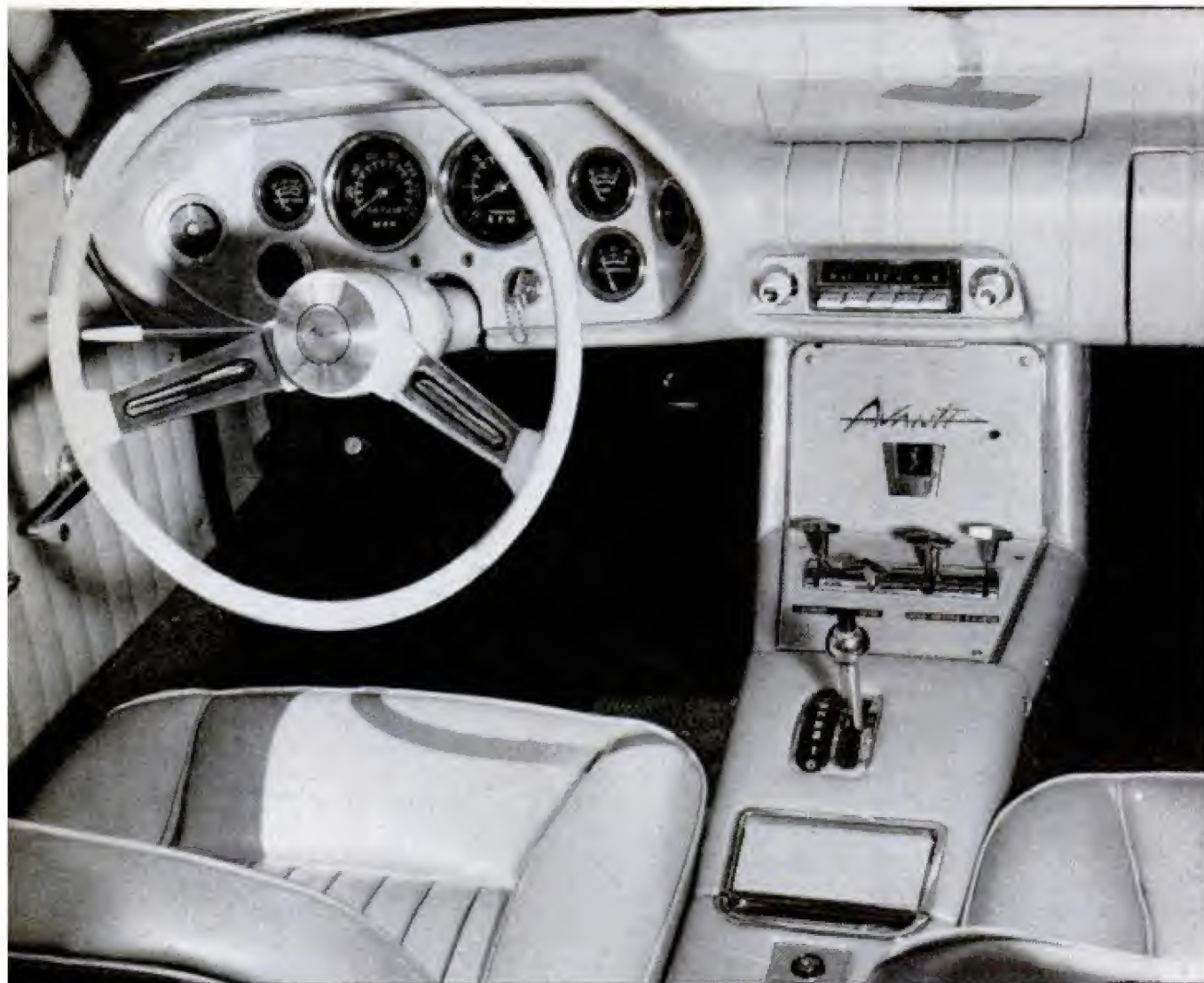
★ ★ ★



# AUTO PREVIEW:

## What You'll See in '63

*PM's factual roundup of advance information on styling and engineering of the new models*



STUDEBAKER AVANTI'S bucket seats, center console, better instruments will set a trend for other '63 models

**T**HE 1963 MODEL YEAR will be somewhat different in character from the past two. The floodtide of brand-new cars shows signs of ebbing; there will be only two new arrivals on the scene — both of them “personal” cars at the upper end of the price scale. One, Studebaker's Avanti, was an early bird ([see test, page 74](#)); the other is Buick's Riviera.

The Riviera is GM's answer to the T-Bird. It will have Buick's biggest V8 (345 horsepower), choice of automatic or stick transmission, and will be on a 117-inch wheelbase. All Riviera's sheet metal

will be its own, not shared with any other Buick models. T-Bird's wheelbase is 113 inches, which means that the Riviera's designers have aimed to give a little more legroom for rear seat passengers while maintaining the low-slung, compactish, “personal car” look that's made the T-Bird so imitated.

In '62 thanks to these new “personal” cars, we'll see four of the Big Five presenting sporty special edition, four-passenger cars. American Motors remains aloof, while Chrysler will continue its hot touring sports 300; this year it'll be the “J” series.



There will be only two brand-new engines in '63. The "newest" will be from Cadillac. It's an all-new cylinder block precision cast of iron, combined with the current set of cylinder heads. Although basic dimensions of the engine are unchanged, there's a saving of approximately 100 pounds of weight, plus a more rigid block and smoother operation.

The other new engine, a 303-cubic-inch V8, will show up on Chevrolet as the standard V8, replacing the 283-cubic-inch job. Basically, this engine is a larger bore version of the iron "283" V8 with no increase in over-all dimension, thanks to precision casting that also provides a decrease in weight. The 327-cubic-inch Chevy V8 will remain as a power option on the standard passenger-car line and as the basic Corvette engine. The new 303-cubic-inch V8 incidentally will be an option on the Chevy II.

Greatest area of change throughout the industry for '63 will be in body styling. All automakers are making changes, but the most spectacular will come from Chrysler Corporation where changes in sheet metal are tied in with a reshuffling of product lineup.

Chrysler's compacts, having run three years with only minor facelifts, were due for changes.

A larger version of the new Valiant body shell will have a wheelbase of around 111 inches, distinctive sheet metal and will be called the Dart, as the junior member of the three-series Dodge line. This car will be offered with slant six of 170 or 225 cubic inches, and will also have a convertible.

The name Lancer has been dropped; its image was too much of a "no sale" among the compacts.

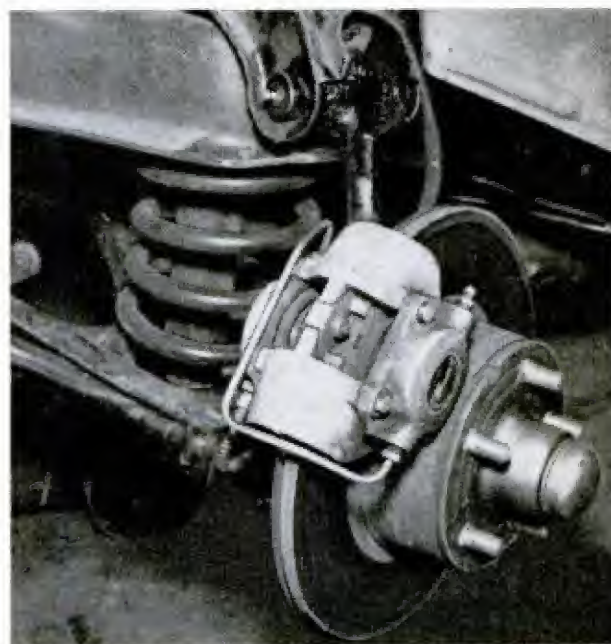
The Plymouth and Dodge Dart (as we know it in '62 form), will still share the same undershell that was all-new in the '62 model year. These cars received styling plaudits when they appeared last year because they were sensibly sized and refreshingly different, with their long hood and short rear deck. Chrysler termed this the "wedge" look.

However, this styling went over like an iron balloon with Dodge and Plymouth dealers and with the public, so Chrysler management hit the panic button. Famed stylist Virgil M. Exner, father of the "Forward Look," went out; in his place is Elwood P. Engle, late of Ford Motor Company and creator of the current Lincoln Continental. Engle's job was to effect the maximum amount of appearance change in Plymouth and Dodge at the lowest cost and in the shortest time.

This was a formidable task because Chrysler's 1963 styling was locked up un-



**BEGINNING OF THE END** for the spare tire; you may see the emergency pressure-can inflator on one model



**DISK BRAKES** optional for Lark and perhaps Pontiac

**AVANTI'S SHELF**-to-trunk hatch—we may see more of it





der normal schedules of tooling. They've done "the impossible," and the '63 Dodge and Plymouth will be so changed that it will be hard to believe that they share most unit body parts with their '62 counterparts.

The Dodge will have a 119-inch wheelbase, increased from this year's 116. The third car to wear Dodge name-plate in '63 will be the "880" which will be, as this year, on a 122-inch wheelbase sharing basic body shell as well as wheelbase with all Chryslers including the New Yorker. The Valiant and the Dart wagon will both have a wheelbase of 106 inches.

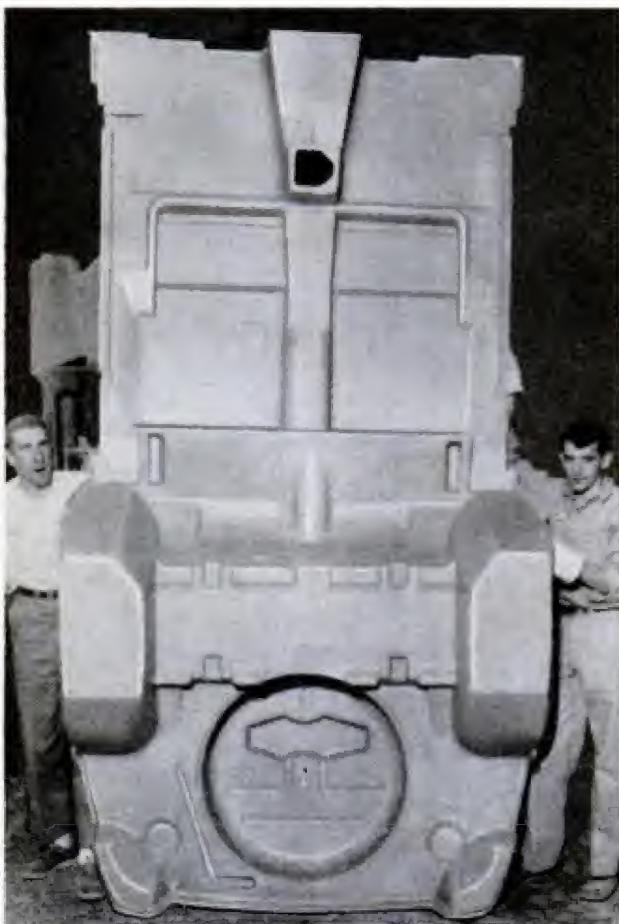
Thus, we have a Valiant and Plymouth, Dart, Dodge, Dodge 880 in the Corporation's two bread-and-butter divisions. The Chrysler line will consist of the Newport, "300," New Yorker and "300J" series.

Imperial remains basically the same in body size and shape but has a distinctive new appearance, thanks to a restyled roof and rear quarter.

Beneath their new skins, Chrysler cars will retain their highly successful engineering features such as torsion-bar front suspension and three-speed automatic transmissions, alternators and sealed in lubrication.

There will be plenty of hot engine options

**AVANTI'S ONE-PIECE** floor pan is molded fiberglass-reinforced plastic. Look for more parts of fiberglass



**EVERYBODY'S DOING IT** on the '63 models; all front turn signals will be amber for greater visibility

and bucket seats spread around throughout the lines.

Most of the action for '63 at GM will center around new styling for the five big cars, Chevrolet, Pontiac, Olds, Buick and Cadillac. There will be new straight-line windshield corner posts and a new roof for the four-door hardtops. The latter will be a hypo for hardtop sales. The "convertible-creased" two-door hard-top seen on Chevrolet, Pontiac, Olds 88 and Buick LeSabre and Invicta, is carried over as it was quite successful this year. All GM's senior cars retain separate body and frame construction with essentially the same frames and wheelbases as in '62.

GM's senior compacts—Pontiac, Tempest, Olds F-85 and Buick Special—get new external sheet metal with a four-inch increase in over-all length on basically unchanged unit-construction body shells. Wheelbases remain at 112 inches, and suspensions consist of coil springs throughout. Styling will be similar to '61-'62; bumpers will be bigger.

Tempest will lose its V8 aluminum option, which has been purchased from Buick for the past two years. This one cost an extra \$216 and sold like a straw hat in January. In its place, along with the smoothed-out tilted four of cast iron, Tempest is expected to offer the option of Chevrolet's new "303" V8 which is light enough to go in Chevy II and expected to weigh significantly less than the Tempest's four-banger. It should reduce the dollar gap to around \$100. This one should prove a lot more popular than the aluminum V8 option which sold so few copies that it's already a collector's item.





HERE'S ONE YOU WON'T SEE in '63: GM's experimental monocontrol. But look for it in '64 on a limited basis

Buick Special continues its choice of aluminum V8 or cast iron V6. At present, Special buyers are voting 63 percent to 37 percent for the V8, probably due to the fact that it runs more smoothly, uses only a little more gas and costs only \$80 more.

Back in the Chevrolet stable, Corvair gets a more noticeable facelift than in previous years, but continues the same basic set of bodies. After all, why tamper with a highly successful formula?

Chevy II will have trim changes to make the car look "richer," but basic sheet metal will be untouched.

The four-cylinder engine will be dropped from Chevy II in '63 to be replaced with the lightweight 303-cubic-inch V8 option. The Four goes out, as it has accounted for but 16 percent of Chevy II production thus far in the '62 model run. Reason for the unpopularity of the four would seem to be its high vibration level and lack of pep. People don't seem to feel that they need a couple of extra miles per gallon that badly.

The biggest story at Ford Motor Company, of course, went up in the smoke of unproven rumors when the ultracompact Cardinal was shelved (as far as U.S. production is concerned).

However, Ford has a lot going for it, starting with a cleverly restyled Falcon. Added to the line will be a convertible. An option—not available until the spring of 1963—will be the 221-cubic-inch V8 now optional on the Fairlane. Probably a four-speed box will be available with this engine as well as with the Six.

Fairlane will have just a trim facelift for '63 as its unit body frame was all new last year. Added to the line will be a station

wagon and pillarless true hardtop for the bucket-seat trade.

Ford's Galaxie gets a new body shell to be fitted to a frame as in the past. The new bodies are no larger. Ford's styling will be different. The cars will be quickly recognizable as '63 models apart from their predecessors, which is more than could be said of the '61-'62 Galaxie look-alikes.

As a special option, Ford Galaxie will have a swing-away steering column similar to that found on the '62 Thunderbird.

Mercury will share the Galaxie's new body shell throughout the Monterey series, with very different trim and external sheet metal below the belt line. Mercury's compact Comet is slated for minor changes in trim and rear-deck areas. There will also be a Comet convertible.

The same sort of thing will be done with Meteor as with Fairlane; a facelift involving trim only, plus addition of a station wagon and true hardtop to the line.

The Meteor and Fairlane Wagons, incidentally, will have top-of-the-line models with imitation wood paneling. This means that there will be panelled Squire models on all Ford and Mercury lines—six different models in all.

The big T-Bird maintains its basic body for the third and probably final year of current unit body cycle, which started with the '61 model. However, there'll be a lot of change in the grille and some new sculptured sheet metal on the front fenders and door.

Lincoln Continental will have a very different grille to remedy just about the

*(Text continues on page 75)*





PM ROAD TESTED two different Avantis. One was equipped with Studebaker's three-speed, torque-converter automatic transmission; the other had a four-speed, fully-synchronized manual transmission.

Both were supercharged with direct-drive Paxton centrifugal blowers capable of forcing up to five pounds per square inch of air pressure into the dual throat carburetors of their 289-cubic-inch V8 engines.

Both cars proved "living bombs." Both accelerated from a standing start to an honest 60 miles per hour in less than seven seconds. After a couple of practice runs on the stick-shift job, PM's auto editor lashed out the 0-60 run in 6.7 seconds.

The automatic job required about 6.9 seconds for the run, but this was due to engine hesitation caused by some carburetor percolation.

Here's how the high-speed stick drill goes; with your foot on the brake and the floor selector lever in "L," rev up to about 2500 r.p.m. on the tachometer for an instant come off the brake and go all the way to the floor with your right foot until the tach hits the red line at 5600, then move selector briskly to "2" position and wait for the needle to hit 5600 again, move the selector to "Drive" and before you reach 4000, you've flashed way past 60.

The Avanti becomes, by virtue of its blower and estimated 275 horsepower, the fastest four-passenger production car made in the U.S. with an engine of less than 300 cubic inches displacement.

Fast and stable enough for almost all varieties of high-speed road driving in stock trim, it will cruise at 100 miles per hour, and its top speed is in the 130 neighborhood.

And Avanti has remarkable roadability. Only Corvette can outhandle an Avanti that's been ordered in its most sporting trim.

Common to all Avantis, no matter what the engine transmission or steering options, is the braking system with the Bendix caliper disk brakes at the front and the big finned 11-inch drum brakes at the rear. A power booster is standard, but this vacuum booster is designed to a limit of 2000 pounds line pressure so that you get easy initial action slowing down from moderate speeds, but boost action tapers off so that you don't run the risk of locking wheels.

Studebaker engineers have gone to great effort in building a safe and well controlled chassis necessary in a car with 270 horsepower and weighing 3100 pounds.

There are torsion bars to control sway both front and rear as well as rubber-bushed torque rods to anchor the rear axle.

In spite of these measures Avanti is not quite a true sports car and cannot be taken out and raced.

The reason is pretty basic—weight distribution. About 58 percent of the 3100 pounds are on the front wheels, which means that the car will have understeering characteristics and will not handle on curves as well as it must to compete successfully.

Studebaker suspension engineers would love to have 52-48, or 50-50 distribution front and rear, but the heavy cast-iron V8 engine tips the scales in the wrong direction.

As it stands Avanti comes as close to being a true sports car as any other production four-passenger car in America, and offers a very comfortable ride in the bargain. In an era clotted with "sports type" cars this is no mean feat. ★ ★ ★



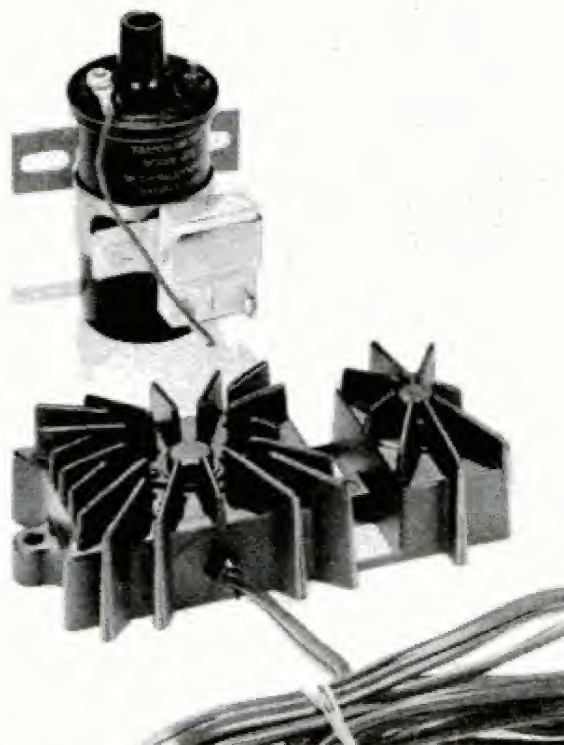
only controversial area in its extremely popular styling.

In engines, there are no startling changes anywhere in the Ford family. The faithful old 292-cubic-inch V8, in itself derived from an engine introduced in 1954, will be dropped from its position as the "standard" bottom-of-the-line V8 on Galaxie and Mercury Monterey. In its place will go the new lightweight V8 now used on the Fairlane and Mercury Meteor. This engine will be in its 260-cubic-inch size rated at 164 horsepower—a version that's now the "hot" option on the Fairlane and Meteor. Fuel mileage should be about 1½ miles per gallon better on the new engine, and performance as good if not better. The weight reduction of the new engine should more than make up for the difference of just six horsepower.

Biggest news engineeringwise from Ford is a brand new three-speed manual transmission with full synchromesh. An industry first, it is available on Galaxie, Fairlane V8, Econoline trucks and F100 pickups.

Big news at American Motors concerns an entirely new body for the Classic Six and Ambassador V8 series. This new body, unit construction of course, succeeds the familiar and much changed shell that first appeared as Rambler in 1956. This old body served its masters well, having gone through three complete phases: The Basket-Handle Roof (1956-57), the Knife-Edged Fin (1958-60) and the Breadloaf or Parker House Roll shape of the current model.

American Motors has been very secretive about this all-new Classic body, but we gather it will end the school-teacherish image and have a strong appeal to the "younger set." This will not change the



**TRANSISTORIZED IGNITION** will be factory equipment on more than one '63 model of GM and Chrysler Corp.

pleasant and practical character of Rambler. It will simply be crisper and more sporty in appearance. As an example, we have it from an AM executive that the Classic station wagon's roof will no longer dip as it continues aft beyond the door.

Mechanically, Ramblers will have few changes.

There are rumors an aluminum V6 will appear at American Motors, but we strongly doubt that it will happen this year. Traditionally AM follows the practical course of ex-leader George Romney, and

(Continued to page 182)

### **Light, Low and Thrifty—That's Your 1973 Car**

Your 1973 car could weigh half a ton less than the one you're driving today. By the next decade, designers will slash off as much as 1000 pounds, cutting average total weight to about 2300 pounds. This will be done mainly by reducing body weight up to one third with such materials as fiberglass or aluminum honeycomb, by improving manufacturing techniques and body panel shapes, and by decreasing engine weight.

These predictions were made by Dr. George A. Hoffman of the Rand Corp. at a recent Highway Research Board meeting. He also said greater intricacy and advanced materials will raise prices (in terms of 1962 dollars), but you'll get better performance at lower cost per mile.

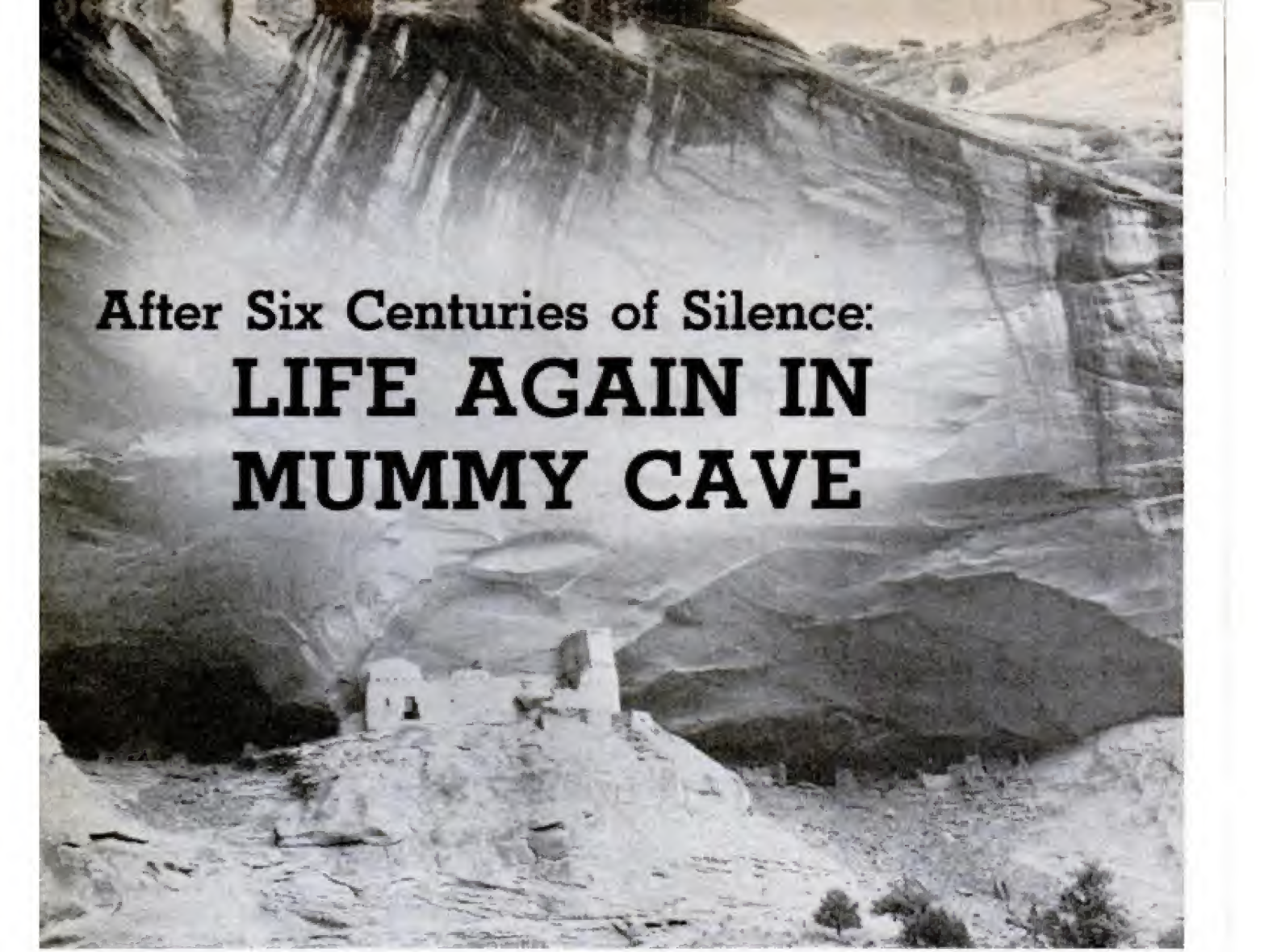
Dr. Hoffman sees little change in length

or width of cars, but a four to six-inch drop in height.

"Great changes are just around the corner," Dr. Hoffman said. Electric cars are a real possibility for short city trips. Since radical changes are accepted slowly, Dr. Hoffman feels that the piston engine still has a future, as it costs least to run and has only the rotary combustion engine as a close competitor (see PM June 1962, page 88). More energy will probably be obtained from livelier gasolines, reducing consumption 25 to 50 percent. Horsepower could be upped 20 percent or more.

According to Dr. Hoffman, improved tire life, reliability, better cord design, fewer plies and other advancements may reduce a tire's rubber content by 33 percent.





## After Six Centuries of Silence: **LIFE AGAIN IN MUMMY CAVE**

**By Richard Dunlop**

**F**OR MORE THAN 600 years Tower House has looked down empty-eyed from Mummy Cave upon the impregnable cliffs of *Canyon del Muerto*.

Abandoned mysteriously by its inhabitants around 1300 A.D., the spectacular ruin in northeastern Arizona has withstood the passage of time because it is sheltered from pounding rains by a beetling overhang of rock and is high enough from the canyon floor to escape the flash floods which rampage down *Canyon de Chelly* and its tributary *del Muerto*.

Because the ruin is considered one of the most significant in the Southwest, some hardy visitors defy the canyon's unpredictable waters and quicksands to drive four-wheel-drive trucks along the canyon floor to Mummy Cave. Others enter the canyon in a specially equipped vehicle operated by a national-park concessionaire from Chinle.

Today the Mummy Cave ruin is threatened with destruction. The wind, rising on the desert, sweeps up the canyons and whistles off the 1000-foot walls of red sandstone. It churns into Mummy Cave which, ironically, ages ago it had scoured from the

rock, and strikes a vandal's blow against the ancient walls of the ruin. Goats from the Navajo farms on the canyon bottom clamber up the face of the cliff and rummage about the deserted rooms of the ancient ones. An occasional visitor chips at the ancient masonry in an eager search for souvenirs.

The National Park Service's Southwest Archeological Center at Globe, Ariz., keeps a protective eye on the prehistoric ruins of Arizona and New Mexico. When action is needed to preserve the structures of the past, the ruins-stabilization mobile unit goes out to the site. I was authorized to join archeologists Roland Richert and Joel Shiner and a crew of Navajo Indians on one of these trips in order to report their progress to the readers of *POPULAR MECHANICS*. Because of Mummy Cave's location in remote Navajo country, the lengthy approach to the site through deep winding canyons, the stifling heat and blowing sands of the summer and the sudden chill and rains, the flash floods and the quicksand of the fall and spring, the work promised to be difficult.



**GENERAL VIEW** of Mummy Cave shows whole pueblo, including east and west grottos. Tower in center was watch tower, just as in a fort. Overhanging rock looms about 1000 feet above cave

**CLOSE-UP VIEW** shows Navajos repairing centuries of wind damage to pueblo buildings. Whenever possible, they use original stones which were blown loose. If not, they create close replicas



"The unit is employing some unusual techniques," I was told.

When I arrived at Chinle at the mouth of *Canyon de Chelly*, a mist was drizzling down on the straggling Navajo settlement. It had been raining when I crossed the Chuska Mountains from New Mexico on a slithering mud road, and I was apprehensive about flood water in the canyon for I knew that the *Rio de Chelly* rises in the mountains.

Roland Richert was already encamped with the Navajos at Mummy Cave, but Joel Shiner met me at Chinle. Joel was operating the supply line through the canyons to keep Rick stocked with necessities from personal effects and food to tools and cement for the stabilization work. Over dinner at the guest ranch he told me about Mummy Cave.

"It's ironic," he said. "The Navajos claim their ancestors ran the pueblo people out of the canyon, and now they are working to keep the ancient pueblo dwellings from falling down."

Actually, Shiner pointed out, archeologists doubt that the Navajos were responsible for the exodus from the several hundred separate ruins in the *Canyon de*

*Chelly* and its tributaries. Most of the cliff-hanging villages were built between 350 and 1300 A.D. The earliest structures yet excavated are circular in shape and called pithouses because the lower parts were pits dug into the ground.

"These early Indians did not even know how to use a bow and arrow," said Joel. "They used a spear-throwing tool we call the *atlatl*. They did not know how to make pottery either, but they grew corn and squash and they wove very fine baskets and sandals. That's why we call them the Basketmakers."

In the course of centuries the Basketmakers learned how to make pottery and bows and arrows and to cultivate beans. They learned how to build dwellings of stone joined together into apartment houses, which so surprised the first Spanish explorers when they reached the region.

"We know most of the big cliff dwellings in these canyons were completed between 1100 and 1300 A.D.," said Joel. "But in the 1200s tree rings show us that what is now the Four Corners region of Arizona, Utah, Colorado and New Mexico went through a long thirst. Probably the cliff dwellers abandoned their pueblos because of the





**WORKING CONDITIONS** were hazardous because cave sits on top of slope high above canyon floor. Mortar was hauled up from bottom by cables strung over scissor braces (arrow). Navajos are repairing retaining wall

drought and moved to other sites in the southwest where their descendents live to this day."

The Navajos arrived at Canyon de Chelly about 1700 and built their hogans of logs and poles and tended their flocks of sheep (which they stole from the Spanish). Possibly they chased some Hopis out of the canyon when they arrived, because the Hopis occupied some of the ancient cliff houses seasonally after their builders had gone away.

"Anyway," concluded Joel, "The Navajos are interested in the Indian past. When we dig up strange things in the old ruins, we ask them, 'What did they use this for?' They compare the ancient utensils with contemporary Indian tools and tell us what they are. They can even recognize prehistoric seeds discovered in refuse heaps of long ago."

In the morning, ranger Homer Robinson reported on conditions in the canyon.

"The water's been rising two inches an hour," he said.

But Joel decided that with a winch-equipped, four-wheel-drive truck he would be able to get through. Soon we were grinding in low gear through the first of more than 80 fords we were to make through the frothing brown waters of the river in order to get to Mummy Cave. Water gushed up through a hole in the floorboards. We splashed through a grove of flooded cottonwoods. The cliffs loomed high on each side of us.

"If we get stuck in quicksand and the

water rises too high, we can always get the Navajos to lead us up the cliffs," said Joel.

He smiled at my uneasy glances at the sheer rock walls. We seasawed back and forth across the canyon wherever experience and his practiced eyes told him the sand was firmest. The river, bent on its own designs, followed an even more erratic course, cutting away its banks so that when we plunged into the water we were never sure we would be able to charge up the other side. Once we were defeated by steep new cuts and had to drive along the river bed for some distance before we could regain the shore.

"Good place for quicksand," worried Joel, but we made it safely.

From time to time Joel pointed out ancient pictographs painted on the cliffs.

"The Basketmaker pictographs are all red," he explained. "Those from the Pueblo period are white, and the Navajos, are in two or three colors."

### Log Bombing

At Antelope House ruins which we reached up *Canyon del Muerto*, we saw inscriptions of all three periods at one place. At this ruins we also saw Navajos constructing spider jetties of crossed timbers and barbed wire to keep the river from eroding the slope at the foot of the structure. Suddenly, the Navajos set up a shout. High on the canyon rim, a red flag waved and unseen hands pushed out what appeared to be a tufted pencil of wood, until it fell with a crescendoing hiss and struck





**ADDITIONAL HAZARD** was fumes from dust and fetid remains of centuries-old garbage uncovered by excavations. Workers wore respirators to avoid infection while digging trench to lay new foundations

the sand with a bomblike concussion. It was a full-sized tree trunk stripped of most of its branches.

"The Navajos throw fire wood down into the canyon," said Joel. "and since it is such a long haul in from Chinle, they also drop timbers in for our construction. When we cut the tree, we leave top branches on to guide the log's fall so that it lands upright in the sand. If the log hits at an angle, it splinters into kindling wood."

The logs came whistling down, one after the other, some sticking upright in the canyon floor, others spewing the sand and falling over on their sides.

"Once, when our chief archeologist was putting in retaining rods and turnbuckles to strengthen the walls of Antelope House," chuckled Joel, "he put his camp right under the drip line of the cavern mouth. The Navajos laughed at his mistake. That night it rained, and the runoff from the cliff face thundered down on his tent. The next morning he moved the camp. Not long afterwards a gigantic brow of rock broke from the ledge and landed just where his camp had been."

As we drove farther into the canyon, we passed Navajo families rattling home in buckboards. Button-eyed children smiled and waved to us from their seats behind their solemn parents. Occasionally we saw a hogan, for the Navajos raise corn in the canyon in the summer. As soon as they have harvested, they move to the canyon rim where, they claim, winters are not as severe as down below.

Navajos were drying corn and peaches on the flat ledges at the foot of the cliffs as we hiked up to Standing Cow Ruin in *Canyon del Muerto*. There we wondered at an ages-old Navajo rock painting showing a Spanish cavalry unit accompanied by a priest. A forgotten artist had seen an early Spanish expedition invading his homeland and had portrayed it on the sheltered rock near a blue-and-white painting of a bison from which the ruin takes its name. In *Canyon de Chelly* and its tributary the past sometimes seems more real than the present.

At one point we discovered a ranger and his jeep mired in the quicksand and stopped to pull him out. The next day we also came across the guest ranch's canyon-excursion vehicle trapped by the sands. But we got through to Roland Richert's camp without trouble. Rick was taking a lunch break when we arrived, but he immediately began to check with Joel on the supplies. He was particularly pleased to know that we had brought back the cordless drills. When fully charged, they are good for 10 hours of labor-saving drilling into the rocks and walls.

The archeologists discussed progress, and I watched the Navajos play a primitive dice game with three cylindrical sticks, flat on one side and round on the other. The players bounced the sticks off a rock in the center of a ring and scored by the number of flats or round sides that came up. The game proved so fascinating that Rick had to shout at his men to get them back to





◀ **RETAINING-WALL** foundation consists of common cinder blocks which will later be covered up. Original stone is used for top layers which will be exposed

▶ **NEARING FINISH** (right), wall is viewed looking back toward central pueblo. When completed it will serve as pathway for tourists expected to flock here

work when lunch was over. The Navajos climbed catlike up the steep trail which the ancient ones had taken to the cave, but we took a more circuitous route up a series of crude stepping stones set in the dusty refuse of a thousand years of human habitation, which slopes steeply for 200 feet from the cave ledge to the canyon floor.

At last we were approaching Mummy Cave and the singular ruins of a town erected during the golden age of the cliff dwellers. To the great archeologist of the 1920s, Earl H. Morris, Mummy Cave was one of the finest of southwestern ruins. It is situated in twin recesses, 600 feet in depth, which face to the south and west to catch the warmth of the winter sun. The remarkable tower dominates the structure. Some think it served a religious purpose, but Morris at least believed it was a fortress and house replete with a parapet.

Spanish raiding parties must have seen the Mummy Cave ruins when they pursued warring Navajos into the canyon, and in 1863 Kit Carson noted it. In 1883 Cosmos Mindeleff mapped Mummy Cave and took photos. In the 1890s a trader from Chinle dug into it and sent a collection of relics to the Brooklyn Museum of Natural History. In 1922 Earl Morris arrived and systematically explored the refuse slope below the dwelling. Comparing the collapse degree of the tower with the descriptions left by Mindeleff, he recognized the urgent need for stabilization work.

"The high front wall of the tower had parted from the others and begun to settle outward to its fall," he reported.

The prehistoric retaining wall built to secure the footing of the tower had failed. A five-foot ragged hole had opened in the

building's base. Pack rats delved in the crannies. Then, as now, winds howled into the vulnerable opening.

Morris commenced his pioneer stabilization work by erecting a scaffold. Ignoring the long fall to the rocks below, he climbed down a rope to set short timbers in the crevice in the tower. He chiseled steps in the rock so he could walk at the base of the tower, settling fallen stones in place and cementing them with adobe mortar from clay beds on the nearby canyon floor. He, too, employed Navajos in the work, paying them 20 cents for each pailful of mortar carried to the ledge. He awarded a box of crackers and a can of peaches to the Indian who made the most trips up the cliff face in a day. Throughout the work Morris was constantly menaced by the 50 tons of unstable stone wall which, if it had given way, would have hurled him from his rocky perch to death below. At last this early stabilization work was finished. In the late twenties, Morris' friend, Charles A. Lindbergh, flew his plane low through the canyon to photograph the now secure tower.

### Eerie Tower

When we reached the pueblo, Rick and Joel pointed out the fine work that Morris had done almost 40 years before. They took me into the eerie tower itself. We visited the enormous round kiva, where the ancient Indians held religious ceremonies, and he showed me how Navajo workmen on dizzy scaffolding were putting an integral bar through a wall and tying it to the bedrock of the cliff.

"That wall leaned to the touch, and we had to take urgent action," said Rick.

In rebuilding the masonry of the kiva,



### Modern Tools for Ancient Ruins:

- Cordless drills
- Log beams with steel cores
- Cement pumped under pressure
- Weatherproofing by electrolysis
- Baking bricks with infrared rays

the Navajos were laying fallen stones. Unlike Morris, they were using a cement mortar mixed with mud. To match the reddish hue of the ancient plaster, Rick and Joel ground up sandstone and blended it into the mix.

"Part of the trick of matching the mortar so that only the most practiced eye can tell the stabilization work from the original is to use mud which has been sheltered in the case since it fell from the prehistoric walls. Mud exposed to the hot sun of the canyon floor is faded," explained Rick.

The ruins stabilization men use kaolin clay for white-washing in the manner of the ancients. If they have to give their mortar a yellow color, they employ ochreous rock.

While we were examining the work, a furious barking broke out in the camp far below. A Navajo was driving a raiding pack of Indian dogs from the tents.

"We leave a man in camp or the dogs would eat everything in sight," said Rick. "We're troubled by goats too, and one night a skunk paraded right up to my tent flap."

The National Park Service furnishes the Navajo members of the stabilization unit with transportation and firewood, but they provide their food. Friday evening is pay time, and on Saturday morning they make the trip to the trading post at Chinle to stock up on supplies. They also buy a sheep from Indians living in the canyon, slaughter it and dress the meat. Sometimes the Navajos bring their families to camp. One night while the unit was working at Aztec ruins in New Mexico, Joel was awakened by being violently shaken.

"My wife having a baby," announced a Navajo.

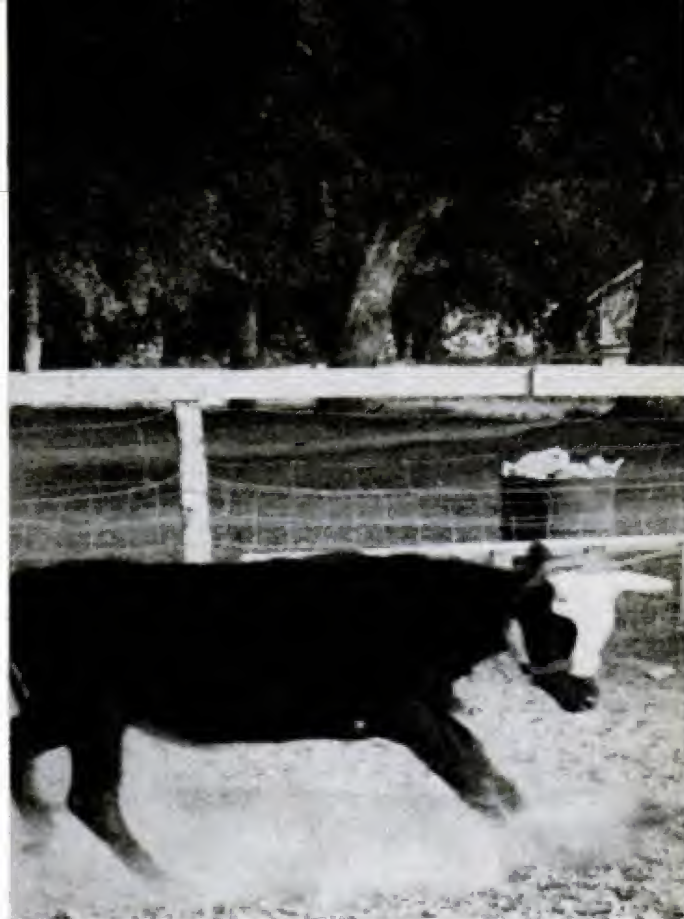
Joel sleepily rolled out of his blankets and took the woman over jouncing roads in his truck to the reservation hospital. The next day after she gave birth, the new mother was proudly showing her baby to the camp.

We watched the Navajos digging a trench through the powdery talus. They were wearing respirators as protection against the virulent dust. Stonemasons were putting cinder blocks in position at the bottom

(Continued to page 200)







**LIKE** the real thing, false horns could give cowboy a wicked blow, as he wrestles a steer to the ground

*And a shudder ran through the Old West . . .*

# FALSE HORNS FOR STEERS!

**By John Boykin and Bob Grant**

Cattle with horns are becoming so hard to find way out in the West that an enterprising cowboy is turning a buck by rigging out steers with false horns for use by rodeo riders.

Richard Ayres, a lean ex-rodeo rider himself, solved the problem of finding steers with horns by doing some home experimenting with plastics at his ranch in Woodlake, Calif. The problem was that when horned stock are found, they are scrubs and their value has been expanded all out of proportion to their worth. Animals that ordinarily sell to meat packers as poor grade canners are given high prices if the seller finds that a roping club wants them.

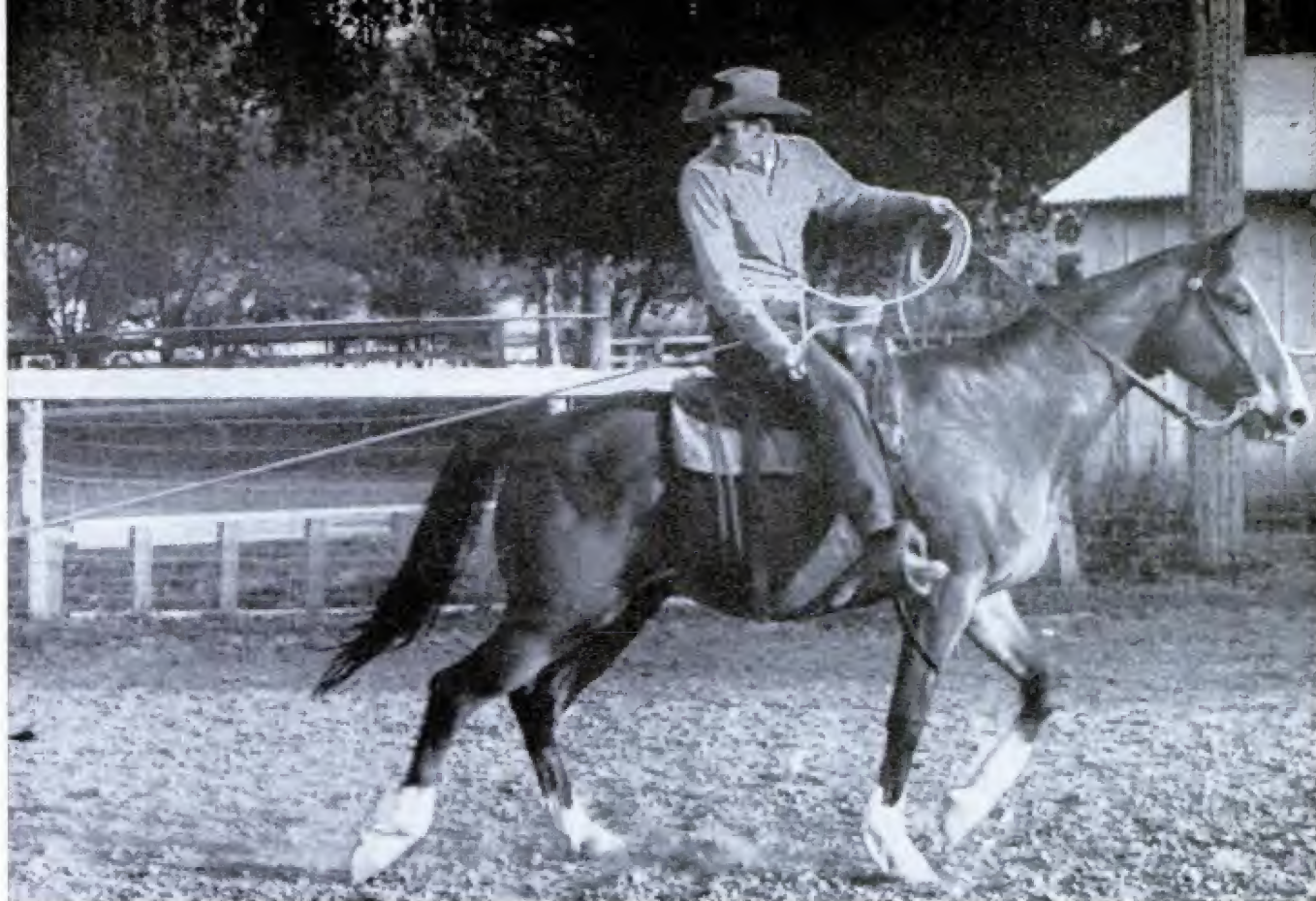
Ayres made several sets of horns—some with extra-wide spread for use in bulldogging and others with smaller spread for roping—out of polyethylene and fiberglass and started showing them around arenas where cowboys practice. Many laughed

when he sat down to talk about phony horns. But the cowboys found that steers with false horns roped just as well and were just as ornery to handle as steers with real horns.

As a matter of fact, the phony horns turned out to have some real advantages. It doesn't hurt the animal to be roped; steers with the real things sometimes have bleeding around the horns when the animal is jerked short by the rope. Another advantage is that when the steer becomes wise to the cowboys' techniques and becomes almost impossible to rope or bulldog, the horns are simply transferred to a fresh animal. The cowboys thus always have a steer on hand that has the right sort of horns.

The horns have been approved by the Rodeo Association for use in the ring but animals with real horns will probably have to become more scarce before they are used before crowds. ★ ★ ★





**YEARLINGS** don't like to be roped, false horns, or not, so the cowboy's problems remain doggedly the same

**INVENTOR** Ayres grinds each set of horns to bleached-out white which flashes realistically

**CHIN STRAP** is a molded piece of plastic which fits snugly and assures good performance. Horns do not hurt the steer







## Corona Hunter

High-voltage electrical losses, called corona, are having a bead drawn on them by men equipped with a "rifle" that picks up their ultrasonic vibrations and pinpoints leaks from powerlines.

Corona occurs whenever voltages are high enough that electricity escapes its path and radiates energy into space. The corona gun, developed by Westinghouse, zeroes in with transducers.



## Rigid-Rotor Helicopter

Using the stable gyroscopic effect inherent in a rigid rotor—one attached firmly to the fuselage via the mast—a new helicopter is stable enough to allow the pilot to fly "hands off" at all speeds.

Normally, helicopters are isolated from the gyroscopic action of their rotors, in effect, hanging freely from them.

The rigid-rotor concept, developed by Lockheed Aircraft, by which the cantilevered blades are attached firmly to the mast and the mast to the transmission and fuselage, resists external forces that tend to change the attitude of the machine, giving it extra stability.



## Giant Rotary Mower

Two giant rotary cutters, with six- and seven-foot cutting widths, can cut hay, shred two rows of corn or cotton, or mow down brush.

The six-foot model, shown, is equipped with a windrowing attachment. Both models have single rotor arms with flail-type blades.

Designed by the Deere Co. of Moline, Ill., they are available as hitch or pull-type units, and with rear or side-mounted wheels.



## Water Mines Coal

Water, blown in a jet stream with enough pressure to slice coal from exposed veins, is now being used to mine the black fuel. The method was developed by the U.S. Bureau of Mines.

The jet is pumped under pressure of 5000 pounds per square inch at 80 feet per second. In one minute, it slams 300 gallons of water against the coal, jarring it loose. It has a potential of mining 50 tons of coal per hour.





### Automatic Loader for Car-Top Boats

Launching and loading car-top boats becomes completely automatic with a new powered car-top rack that uses a battery-powered motor to do the work. The loader "flips" the boat easily into the water in 20

seconds by dropping the transom, then lowering the bow; loading works by reversing the procedure. The Electrolift is made by Stigum & Tweten Co., 5678 N. Lagoon Ave., Portland, Ore.



### Piggyback Loads Sidesaddle

Piggyback rail-and-truck systems gained flexibility with the development of a flatcar which takes all current types of trailers and containers and which permits loading from end, side, or overhead.

The new car, developed by General American Transportation Corp., can be loaded and unloaded without special equipment. With its side-loading facility (see photos), it does not require that the flatcar be uncoupled from the rest of the train.

The special 40-foot container shown slides off the flatcar's rub rails and onto a rear-wheel dolly in as little as three minutes with no special unloading ramp.





# Cantankerous Gramp— The Navy Flier's Conscience

By John A. Linkletter

**N**AVY AND MARINE PILOTS since 1943 have been flying under the close scrutiny of the oldest and wisest aviator in existence, Grampaw Pettibone. And woe betide the young pilot who strays from straight and level!

Gramp, a fictional character whose fumings and mutterings appear each month in *Naval Aviation News*, blisters the flight jacket off any throttle-jockeys unlucky enough to commit the spectacular blunders of the month.

"Jumpin' Jehosaphat!" or "Sufferin' Cat-fish!" storms Grampaw as he proceeds to shred the luckless pilot's flying reputation. Even though names are not named, the pilot's buddies know—and it takes a heap o' flyin' to live down that kind of fame.

It's all done in the interest of safety. "There is no way of knowing how many pilots' lives and how many millions of dollars worth of airplanes Grampaw has saved

by his constant preaching against the flying sins of pilots," says *Naval Aviation News*. "But it is certain both figures are high."

Grampaw Pettibone is credited with bringing to the aviation world the news of the most unbelievable series of mistakes ever made on a single flight.

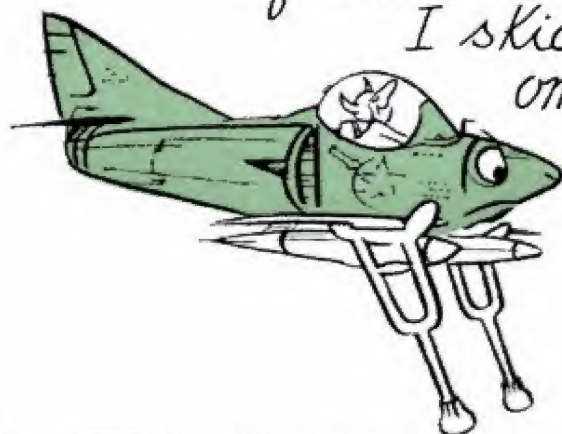
The story involves the pilot of an F9F *Panther*, a jet fighter, flying off the carrier *Essex*. The pilot bounced on a landing and—instead of allowing his plane to go into the nylon arresting barrier amidships—tried to fly it off again. He picked up the nylon tape of the barrier on his landing hook, clogging the hook.

On the way up the deck, the *Panther* hit another plane with a pilot in it, knocking off the canopy and doing other damage. The jet roared off the end of the deck, sinking so low that it skimmed the water as it dragged the nylon barrier tape in its wake.

Before his next time around, the *Essex*



*If the crutches crack  
I skids her in  
on the wing  
tanks!*



← **WHEELS-UP LANDING** by an A4-D pilot brought about a derisive snort from Grampaw Pettibone and a cartoon from Robert Osborn, Gramp's illustrator

→ **AVIATION CADET** who strewed his T-28 across Texas was described by old-pilot Pettibone as being "practically indestructible"



crew cleared the deck and installed a line of tractors behind the barrier to stop him. With one flap and the left wheel missing (they were knocked off in the first pass), the pilot came back again.

This time the landing hook jammed in the up position, and the plane missed the arresting wires. The pilot rammed the throttle forward and the plane sheared off its other two wheels on the tractors. It skidded up the deck on its belly, knocking off the one remaining flap and damaging the wing tanks and the fuselage. Thus torn up, the *Panther* roared off the deck again.

As the *Essex* crew tried to figure out the next move, the pilot radioed, "This is becoming a rather rugged flight." That, Gramp observed, was the understatement of the century.

The pilot was ordered to try a belly landing on a beach, but he ran out of gas on the way in and ditched the plane.

The pilot "doesn't give a hoot about ever trying another carrier landing," commented Gramp, as he reported that the flier had turned in his wings.

#### Occasional Pat on the Back

Occasionally, too, Grampaw will pat a pilot on the back—and precious, indeed, are praises from that old curmudgeon.

"Great horned toadies!" Gramp exulted over one pilot's narrow escape. "Some would say he's lucky, but this man made his own luck!" Here's what the pilot went through to get a word of approval from Grampaw Pettibone:

A jet-fighter pilot in an F3H-2 *Demon* landed aboard one of the Navy's big carriers, and, after his landing hook had been freed of the arresting wire, he advanced the throttle to taxi the plane forward, as directed by a deck signalman.

As the fighter moved forward at an angle, the pilot attempted to apply right brake.

The pedal bottomed out—no brake! He pumped the pedal, attempting to build up hydraulic pressure, and cut the engine. But the plane continued to roll slowly toward the edge of the flight deck.

No one was able to reach him with chocks, so the fighter went over the side. The plane went on its back as it entered the water.

The pilot opened the canopy just before the jet hit and held his position, securely strapped in, during the first five or six seconds of rushing white water and severe turbulence. He was on 100-percent oxygen (through his mask) and was having no difficulty breathing.

He released the two shoulder rocket fittings of his integrated seat belt and ejection seat, and by much twisting and pulling—for he was hanging inverted in the cockpit—managed to release first one and then the other of the lower rocket fittings.

Disconnecting his oxygen hose, he pushed himself downward and was about two-thirds out of the cockpit when he found himself still secured by the leg-restraint cord of the ejection seat. He couldn't pull himself back into the cockpit to actuate the leg-restraint lever, so he pulled out his survival knife and, with eight or ten sawing strokes, managed to cut the cord.

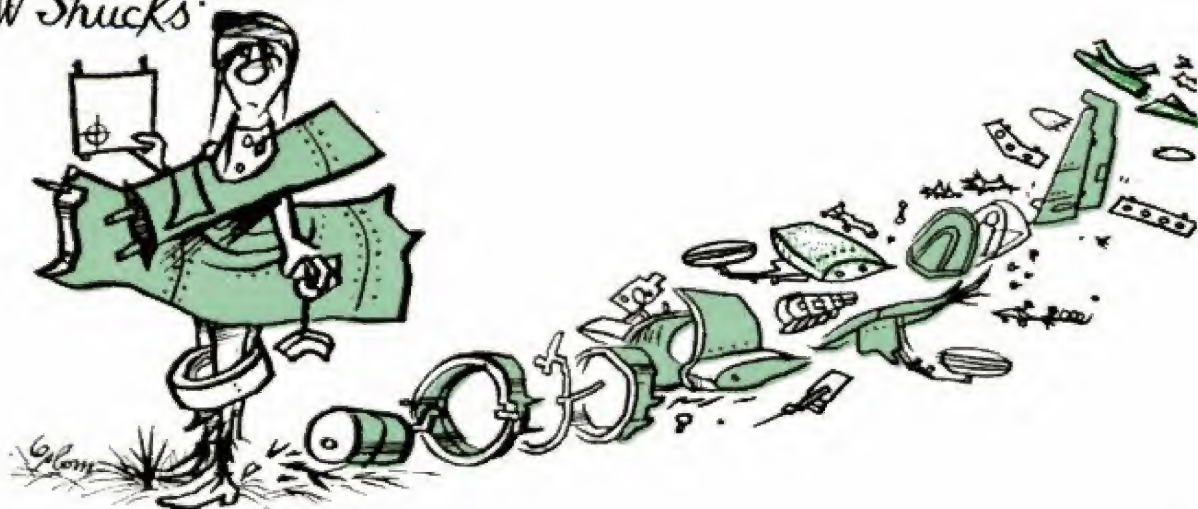
The pilot was about ready to explode, having held his breath since disconnecting the oxygen hose. He pulled the carbon-dioxide inflators for his life vest and shot to the surface, completely breathless.

Fortunately, a helicopter was already moving into position over the wreck. Two minutes later the pilot was safely back on the carrier's flight deck.

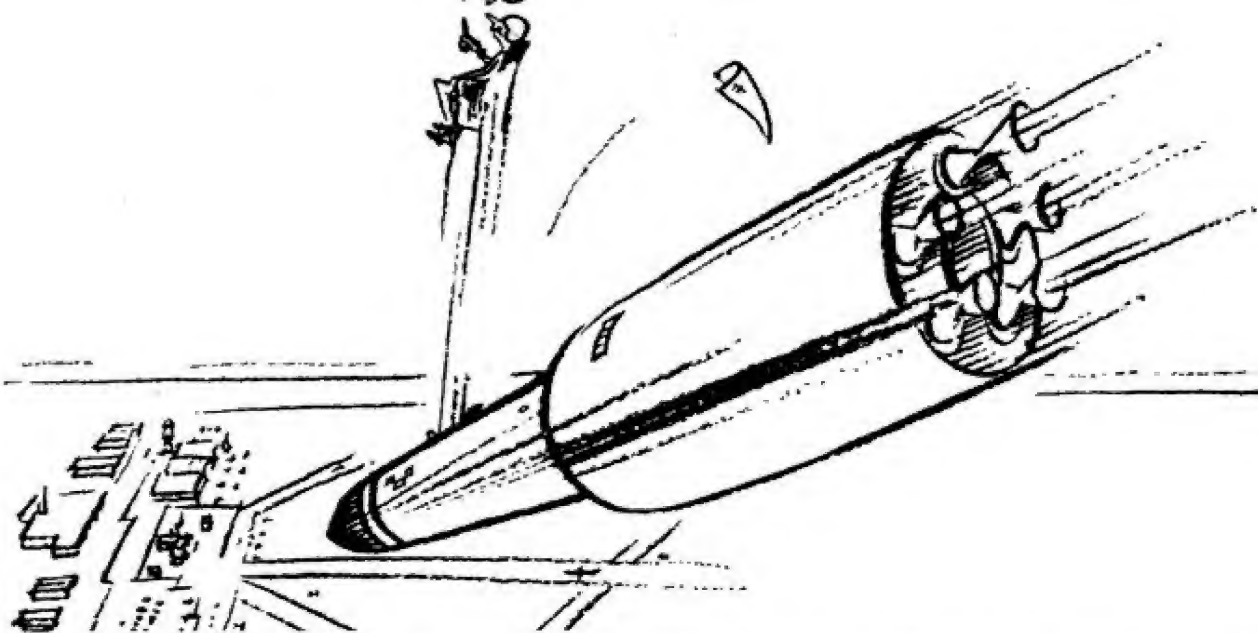
His injuries? A small cut on the left thumb from checking the sharp edge of his knife before cutting himself free!

Grampaw Pettibone, after praising the pilot who had "made his own luck," did

*Aw Shucks!*







JET FIGHTER, abandoned by its pilot, was characterized by Grampaw Pettibone as an "unguided missile"

manage to add one safety suggestion—that a brake check be made after disengagement from the arresting wire and before applying throttle to taxi.

Less fortunate in Gramp's notebook was the torpedo-bomber pilot who transferred to float planes. On his first float-plane flight he tried to land on the concrete runway of his new air station. Only the radio-man's frantic warnings stopped him.

"Then the pilot circled the field and made a good landing in the bay," Gramp reported. "After taxiing up to the ramp, he got out on the wing and turned to the radio-man and said, 'Good work! That certainly was a dumb stunt, trying to land on the field on floats.'

"And with those few kind words, he jumped from the wing onto the field—I mean in water up to his neck."

### Indestructible Cadet

"Some folks . . . seem to be practically indestructible," commented Gramp when he reported on a T-28 pilot who spread his airplane over the Texas landscape and managed to come through alive.

The pilot, an aviation cadet, was engaged in practice glide-bombing runs. Standard entry into the runs is at a speed of 140 knots and at an angle of 40 degrees. And the passes are ordinarily completed at a considerable height above the terrain.

However, the cadet entered his dive at 170 knots and at an angle of 45 degrees.

Pulling out at a speed of 290 knots, the cadet noted that he was in a 4 to 4½-G recovery.

"The plane felt like it stalled violently as my nose came through the horizon," he related, "and then I realized something was wrong. I took my left hand off the throttle to help recovery on the stick, and then I found I had no control of the plane."

"I looked out and saw I was too low to

bail out, but already I had put the canopy handle to the emergency position when I saw that I was losing parts of the plane."

Let Gramp take it from there . . .

"I wish that everyone who is tempted to exceed G limits could see the trail of parts this plane shed before impact with the ground. They were spread along a 3800-foot area in this order: The horizontal stabilizer and elevators were the first parts to fail; then came the port and starboard outer wing panels, the port and starboard flaps, the rudder, the canopy, and the port and starboard inboard wing panels with landing gear attached to each.

"After losing all of these parts, the fuselage and engine hit the ground in a slight nose-down attitude. The engine and fuselage forward of station 73 broke off on impact. The pilot and what was left of the fuselage sailed another 100 feet along the ground to the spot where he crawled free."

As Gramp said, some folks seem to be practically indestructible.

Pilots aren't the only ones who come in for words from Gramp. Consider the case of the mechanic who walked too close to a jet tailpipe and had all his hair burned off. He bought a wig and went back to his job on the flight line. On his first day the intake on a jet sucked his wig into the engine.

"Brother, you've had it!" bellowed Gramp. "Maybe you ought to get into some other line of work!"

And there was the radio operator on a P2V-5 *Neptune* who reeled out a trailing wire antenna (with weights) without getting permission from the pilot—or without even telling him about it.

An hour after the plane landed from a cross-country flight, word reached the base that during the landing, the trailing antenna had cornered a diesel engineer in a roundhouse and flattened him. He wound up in a hospital with leg injuries.





**BARBED ART**, part of Pettibone presentation, underscores causes and effects of "head up and locked" piloting

Gramp reminded the pilot that it's his responsibility to have his crew under control, but then admitted that this case proves "You gotta get up mighty early to outguess some people."

As long as airplanes have retractable wheels, there'll probably be planes landing with the wheels up. Back in the all-propeller days, the pilot's first clue that he was making such a landing was when the tips of the blades started bending backward before his eyes. Other damage followed soon after. Jets, though, can sometimes skid in virtually free.

An A4D Skyhawk managed to get down to the runway without benefit of wheels after the pilot neglected to lower them and the "wheel watch" (a man stationed at the end of the runway) didn't get a warning flare fired in time. (In the latter's defense, he thought the A4D was too close to a preceding plane and that it would not land.)

Luckily, the plane was carrying two 150-

gallon drop tanks on which it slid for 1000 feet with very little damage.

"Bust my blood vessels!" Gramp spouted. "This guy came out smellin' like a rose from a situation that in any other plane than the A4D would have meant an overhaul job!"

After a few more expletives, senior-citizen Pettibone assessed the pilot's action: "He just plain doped off!"

A pilotless plane can be an "unguided missile," Gramp pointed out in the case of an FJ-4B Fury abandoned by its pilot.

During bombing practice, the jet was damaged when a released bomb exploded prematurely. Climbing to 15,000 feet, the pilot determined that he had a hole in an outboard wing panel and that fuel vapor was streaming behind his plane.

Feeling that he had the fighter under control, the pilot returned to his home field and started a precautionary flameout ap-

(Continued to page 196)

**PARACHUTE**, a lifesaver in the air, becomes a dangerous monster if pilot can't get clear of it in water

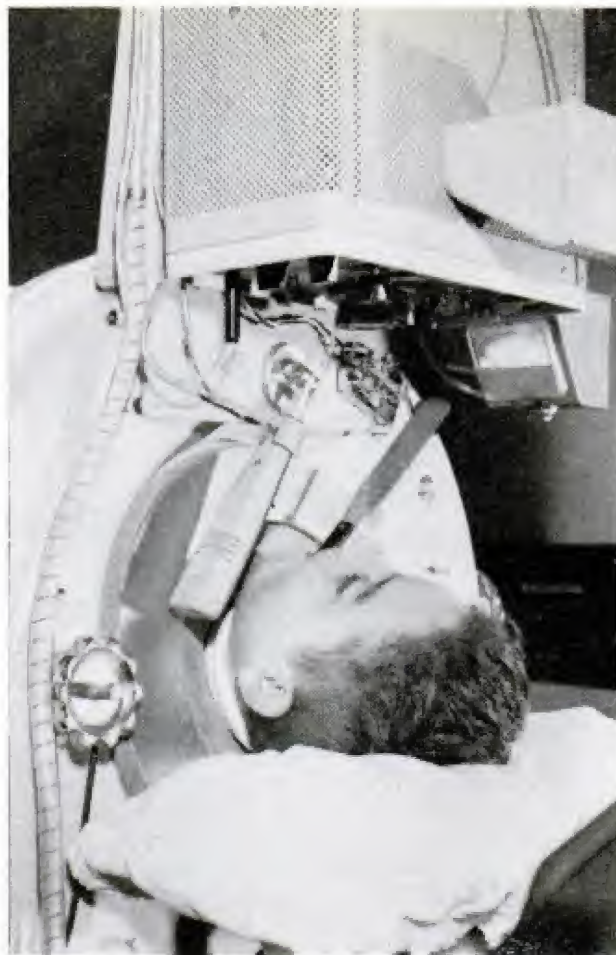






### Solar Space Mirror

By beaming sunlight at a thermionic power unit, an inflatable six-foot space structure serves as a piggyback power generator for a satellite or space vehicle. Developed by Geophysics Corp. of America, Bedford, Mass., it is made of metallized plastic laminate and can be inflated outside of a space vehicle.



### Ham Shack in an Iron Lung

Though confined to an iron lung, a young ham radio operator is able to be on the air daily, manipulating radio controls with a spatula held in his mouth.

The young polio victim, Billy White, 13, of Corpus Christi, Tex., works voice bands as well as code. His call is K5CBZ. His transceiver is on a special bracket.



### Fold-Away Garage

One solution to the car-storage problem for nongarage owners is a new auto cover which folds out of the way when not in use, then comes down like a roll-top desk to cover the car when needed. Called the Carquad, it's the development of Vickers Todd & Dawson, Ltd., of Burgess Hill, Sussex, England.

Made of tough sheet plastic over a metal framework, the "garage" comes knocked down in a do-it-yourself kit form in sizes to fit motorcycles, small cars, or large family cars. It may be fastened to the side of a house or to a fence.

• Water from ancient glaciers probably fills many wells in parts of Wyoming, Montana, and the Dakotas. Ground water in a common sandstone layer may have been derived from ice that melted 12,000 or more years ago.





### Gold-Plated Overalls

Developed for personnel working with highly volatile rocket fuels, a fabric surfaced with 24-karat gold protects them from both chemicals and heat.

Inert to most known chemicals, it also has a heat reflectivity rating of 75 percent, furnishing protection from flash temperatures as high as 3000 degrees F. The fabric is a product of the Du Pont Company.

### Space Command Station

Wheeling through the sky 20,000 miles above Earth, a 50-ton command station is the latest satellite proposed for the U.S.

Lockheed Corp. says such a station may be operational within a decade. Its crew could either make on-the-spot decisions for defense in case of enemy attack, or, more hopefully, direct peaceful exploration of the solar system.

One proposed version of the command post is 200 feet long, has a radiation shielded command center in the hub and is nuclear powered. It has a space ferry for trips to Earth. The 12-man crew would live in a rotating sphere at the end of a long arm.

Circling 20,000 miles—or higher—above Earth, the station would be above the Van Allen Radiation Belts.

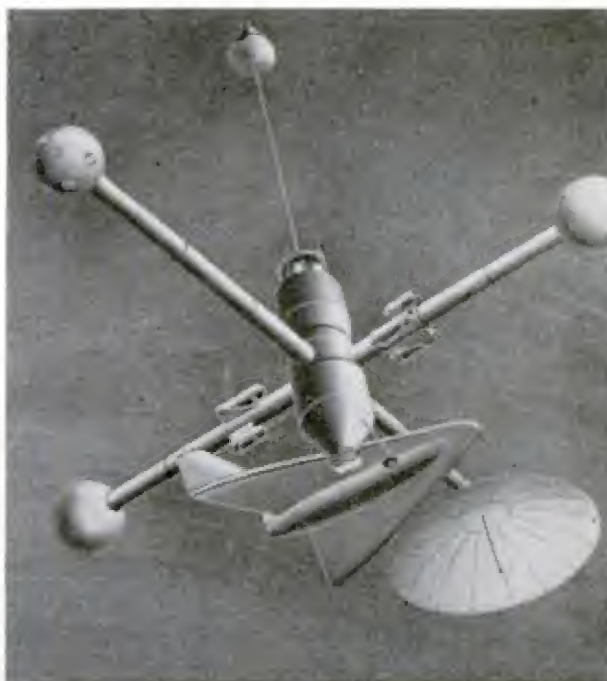
- An average of 44,000 thunderstorms occur each day over the earth as a whole.

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### Receiver Grows Smaller

Miniaturization of an emergency radio receiver has been accomplished by use of molecular electronic blocks. The receiver was reduced in size as well as complexity; 29 components do the work that was formerly accomplished by 219 parts, and the over-all weight of the unit has been lowered from five pounds to one-half pound. Westinghouse designed it for the Air Force.







**SMART FISHERMAN'S REWARD:** A tremendous string of bass on a hot day

**O**NE GREAT TRAGEDY of American family life is that, in spring and fall when fishing is at its average best, the average fisherman is so busy hanging screens, storm windows and whatnot that there isn't time for serious fishing.

Then, in midsummer, with everything pretty well under control, he takes his fishing vacation—and doesn't catch anything, unless he goes into the far north where it's spring in July and autumn in August.

Fishermen, guides and resort owners have a lot of explanations for the slow fishing in hot weather. They range from the familiar comment that they simply aren't biting to the wild theory that the northern pike shed their teeth in the summer. (Despite repeated denials by ichthyologists, the latter theory persists in some northern areas.)

True, the fish aren't feeding as ravenously as they did in the spring when they came out of their winter dormancy, and they aren't as active as they were during the spawning season. But they're still eating. Most fish biologists agree that a big fish must feed almost constantly simply to stay alive. The trouble isn't based on their feeding habits; it's that the fish have moved out of the shallow feeding grounds.

As the days grow longer and the sun climbs higher, surface water, especially in the shallows, warms until neither game species nor bait fish are comfortable in it. They move into deeper, cooler water. Smart fishermen go after them—and catch fish. The rest use the same methods in the same places that took fish in April—and very often get skunked.

When fishing becomes hunting, it pays to understand

# Fish Deep in Summer Heat

*Summertime, and  
the living is easy,  
but the fishing is  
tough . . . unless you  
know how to find  
and take deep-lying  
fish in their  
summer hideouts*

**By Dick Kirkpatrick**  
**PM's Outdoors Editor**





**FOUR GOOD "ASSISTANTS."** From left, fish finder, depth indicator, depth thermometer, and a good map

your quarry's habitat. As the summer sun warms the surface waters, the water in a deep lake forms itself into three layers. A light, warm water stays on top; the colder, denser water stays deep; and the boundary area between them becomes a thin belt, roughly 6 to 20 feet deep, with a very rapid temperature drop from top-water temperature on one side to bottom-water temperature on the other. This area of rapid temperature drop, called the thermocline, has the two things the fish are looking for—cool water and enough oxygen for comfort. The warm water above the thermocline isn't comfortable, though game fish will make occasional forays upwards after bait fish, and, except in deep, cold, sterile lake-trout-type lakes, the cold water beneath the thermocline hasn't enough oxygen for them.

Species with a good tolerance for warm water, like largemouth bass, will move up into the shallows at dusk and feed through the night until dawn. But during the day, when the fishermen are out, they're lying in more hospitable waters.

Your heat-shy fish will also find cool, oxygen-heavy water around mouths of streams and underwater springs. You can usually spot a cool area by watching a lake while the morning mist is burning off in the sun. The cool spots will be the last to clear. They're also the first to mist up when it turns cool.

Best spot to look for them, then, is that area where the thermocline layer meets the bottom. There you'll find all three of the things your quarry looks for—cool water, oxygen, and the bottom cover where his own quarry, the bait fish, hang out. Finding that area becomes the big challenge. To keep in touch with that payoff layer of water, you'll need some tools. Something—anything—to tell you the depth at a given spot and the water temperature at a given depth.

The equipment can be pretty simple. A weighted length of heavy line, marked with knots or bits of thread every few feet, will read the bottom depth for you within limitations, and you can pick up a sampling thermometer for as little as \$2.50. You lower it to the depth you think you're looking for, leave it there for at least a minute, then haul it back up and read the thermometer. After a few samples, you'll get the picture.

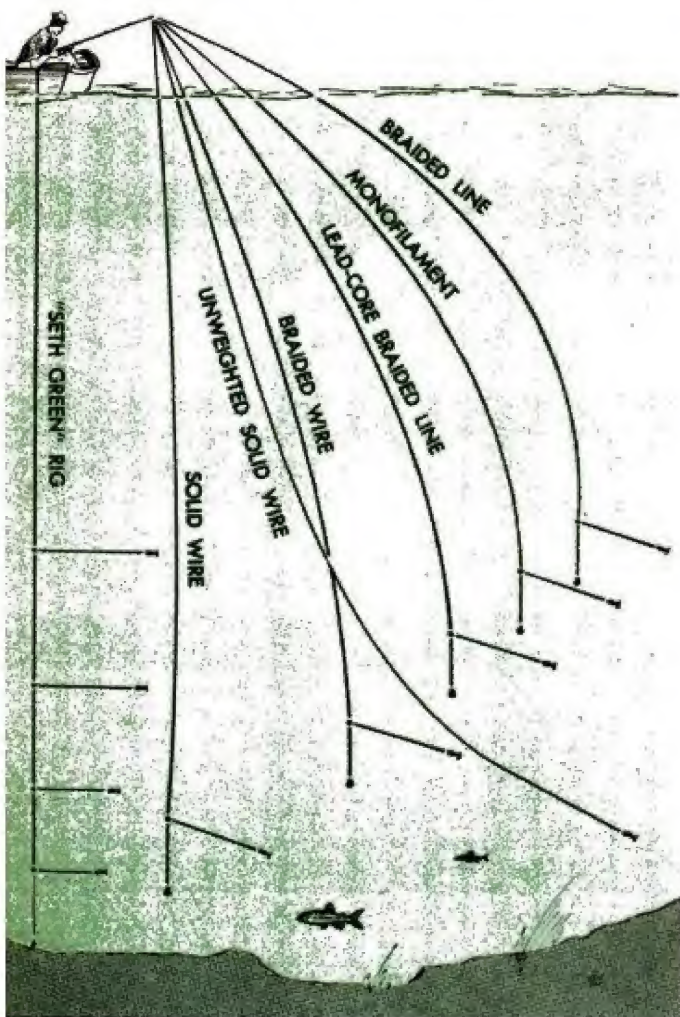
Much better, though more expensive, is the electronic equipment made to do the same jobs almost automatically. A sonic depth indicator (center, photo above) gives you a constant reading of the depth under your boat. A good one will also show a different signal for different types of bottom—rocky, weedy, flat or sloping—and will register a "blip" when a fish swims through its cone of sound. That can be a





**LURES FOR DEEP FISHERMEN:** Top four are caster's deep lures; bottom two are light lures for drifters

**LINE PERFORMANCE** comparison (not to scale) for a fisherman on a slow drift. Equal lengths of line don't reach equal depths; on faster drift, or troll, difference becomes much greater. For light tackle fans, unweighted solid wire line goes deep easily



**SPECIAL GEAR HELPS.** From left, light wire-line outfit, big wire-line reel, lead-core line trolling rig

real help when you're after schooling fish, but it's of secondary value. You're more interested in keeping track of the bottom.

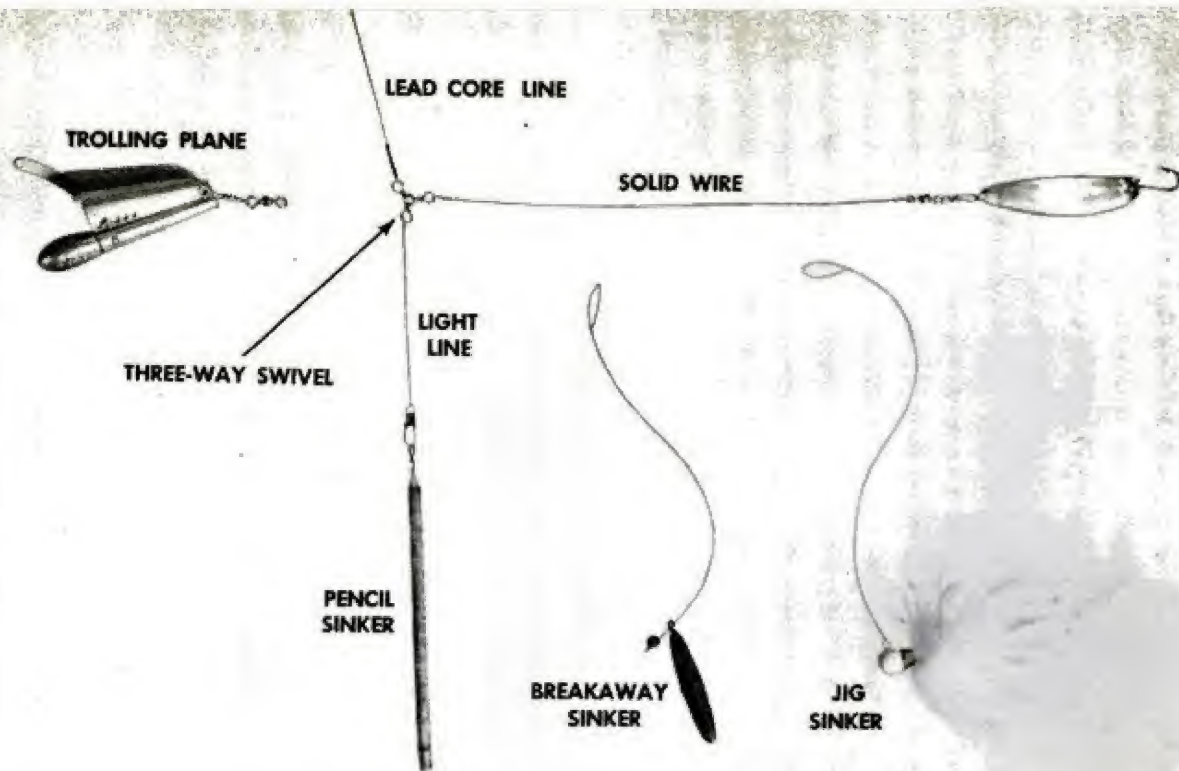
Ideal way to find the temperature at any depth is with one of the electronic depth thermometers (page 93, right). They work with a small thermocouple on the end of a light wire marked for depth. You lower the weighted end, reading the depth on the wire and the temperature on a dial. That way you get a constant, running report from the thermocouple as it sinks, and can pinpoint the water temperatures precisely.

A third electronic tool is side-looking sonar (page 93, left), which locates moving objects anywhere in the water and translates the find—usually a fish—into audible signals through a set of earphones. While it's primarily intended for use on fish in the more familiar shallow waters, it'll also work straight down if necessary, and the deluxe models include a built-in conventional depth indicator.

Just how expensive these three tools are will depend on the value you place on your fishing time—and success. If a \$20 electronic tool keeps you from coming home empty handed on a \$50 fishing week end, you'd have to admit it was worth it.

The Lowrance depth indicator shown costs about \$130. The Aqua-Temp thermometer is around \$20. The Pflueger Fish-Finder is \$80 in the locator-only version shown; it's \$150 with the built-in depth indicator. Expensive? Not to me. My fishing time is valuable and in short supply. I own all three of the helpers shown, and wouldn't part with any of them. They pay their way in fish.





**RIG FOR BOTTOM BUMPING**, foreshortened here, shows author's choice for big fish in deep water. Jig sinker provides weight, takes fish too. Good deep-running plug can be used in place of the marabou jig shown

Another good tool is a map that shows depths and underwater contours. Especially on a strange lake, it'll show the deep holes, submerged islands, watercourses and dropoffs you're looking for. Most state conservation departments either supply such maps or can give you a source for them.

So you've found your fish—or at least you've found the area they should be in. Now the odds have switched to *your* side; all you need to do is catch them.

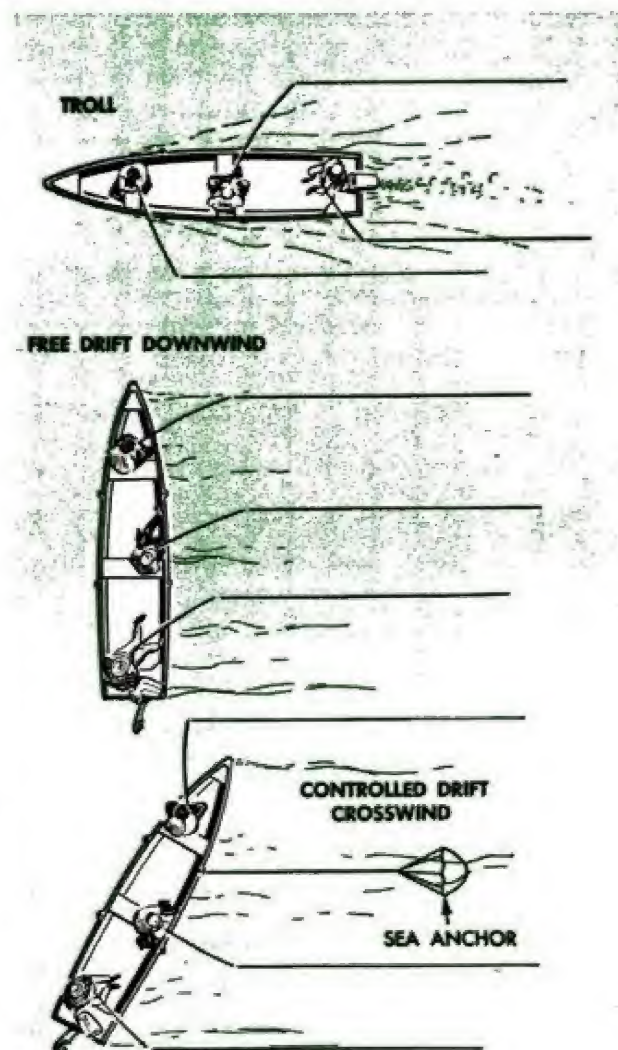
Few fishermen understand how really hard it is to fish at even medium depths, because they almost invariably overestimate the depth they're fishing. You can prove that for yourself easily. Find a spot where you know the water is, say, 25 feet deep. Now put on your deepest diving lure and try to hit bottom. It's harder than you think.

Few standard lures will go beyond 12 or 15 feet down on a normal cast. Almost none of the wobbling spoons, retrieved fast enough to bring out their action, will run even that deep. Spinners are even worse, since most fishermen retrieve them too fast anyway, and they tend to rise on the retrieve.

The obvious answer for fishing that tricky 20- to 40-foot depth is to stay with lures designed to go deep and to fish them carefully to get down as far as possible. Big-lipped diving plugs get down fairly well, but need help. Cast them as far as you possibly can, and retrieve at the lowest speed that will bring out their action. Spoons of maximum weight for their size, stamped or forged from thick metal, will sink fast, and can be

(Continued to page 190)

**BOAT HANDLING** methods for deep drifting or trolling. Sea anchor controls drift speed, also can be mounted to produce "tacking" drift across the wind







### TV Monocle

Without being distracted from flying duties, a pilot can see a television picture of air-traffic information and ground conditions through a lightweight electronic-optical viewer. The television picture is projected onto a transparent-mirror monocle positioned in front of his eye. The image may appear to be as large as eight feet.

Developed by Hughes Aircraft Co., the head-mounted viewer can also be used in such fields as surgery. A surgeon, for example, could monitor a patient's pulse rate while performing an operation.



### Cold Logic

Computers can think more like humans than ever before when directed by a tiny new logic circuit that performs its thinking at a shivery — 452 degrees F.

Like the human brain, the circuit simultaneously compares a fact with all data in its memory and instantaneously associates related information.

Measuring 3 by 6 by .05 inches, its switches become superconductive at low temperatures and then work at high speeds. The circuit, developed by General Electric, will perform its coldly logical work in such jobs as air-traffic control.



### Speedy Dart Drags Home the Hardware

One of the West Coast's top dragsters is the Dragmaster Dart, which has an engine based on a 383-cubic-inch Dodge block with an earlier crankshaft that ups displacement to 425 inches without sacrificing cylinder-wall or crankshaft strength. The fuel system has a Hillborn injector and a reworked

GMC supercharger. Dode Martin and driver Jim Nelson of the Dragmaster Co., Carlsbad, Calif., built the 1100-pound dragster, using thin-wall chromemoly tubing for the frame. The Dart was top eliminator at the Pomona, Calif., Winternationals at 170.18 m.p.h. and elapsed time of 8.71 seconds.





### Hooded Helmet for Jet Jockeys

Sunglasses have always been an Air Force trademark, but the latest fashion for sun protection is a helmet with a hood.

High-flying jet crews encounter consistently bright sunlight in the thin atmosphere of upper altitudes, so glare is a perennial problem. Various sizes and shapes of glass and plastic sun goggles have received official blessings from time to time.

The new helmet, officially designated HGU/9P, may replace the current helmet which has built-in plastic goggles which slide down over the eyes.

### Heartbeat Monitor

Beat-by-beat scrutiny of the heart is possible with a new medical system that translates electrical waves generated by the heart into a blinking light or a beeping sound. The system, developed by the Chemetron Corporation, enables a doctor to know instantly whether a heart has actually stopped or is still beating imperceptibly.

The visual indicator acts through a Veling Heart Monitor (named for its inventor, Dr. William F. Veling) which translates the heart's activity into beeps. Used with the monitor, the visual unit's white indicator light is activated by the heart's electrical waves. If the heart stops, the blinking light goes out, a steady red light comes on and a buzzer sounds. Pressing a button on the indicator case silences the buzzer. It sounds again after five seconds if the heart has not resumed beating.



### Mountain Top Bends Beams

Using a mountain top to "bend" microwave signals, communications engineers have experimentally performed low-power microwave transmission of data over the horizon at high speeds without using relay stations.

Over-the-horizon transmission of television and telephone signals has been done in the past, but such applications require very high transmission power. International Business Machines is using the new "knife-edge diffraction" technique to send data between Monterey and San Jose, Calif.





# WILL SUCCESS SPOIL WALLOPS ISLAND?

*They used sand dunes as blockhouses and their countdown was "Let 'er rip!" But their fantastic record has brought big funds, more men—and a yearning for the good old days*

**By S. David Pursglove**



**OLD** "Never had a rope malfunction yet," Wallops old-timer grouched, recalling days when they used Venetian-blind cord to tie prelaunch cables to test rockets. Today they use temperamental solenoids

**T**HE BURLY COOK glanced at the clock on the cafeteria wall. He dashed to the gas range and turned the flame low under a massive kettle of vegetables, noodles and broth. Sprinting toward the door, he untied his white apron and tossed it at a chair. He emerged into the brilliant seashore sunlight just as the siren atop a white wooden tower began to scream.

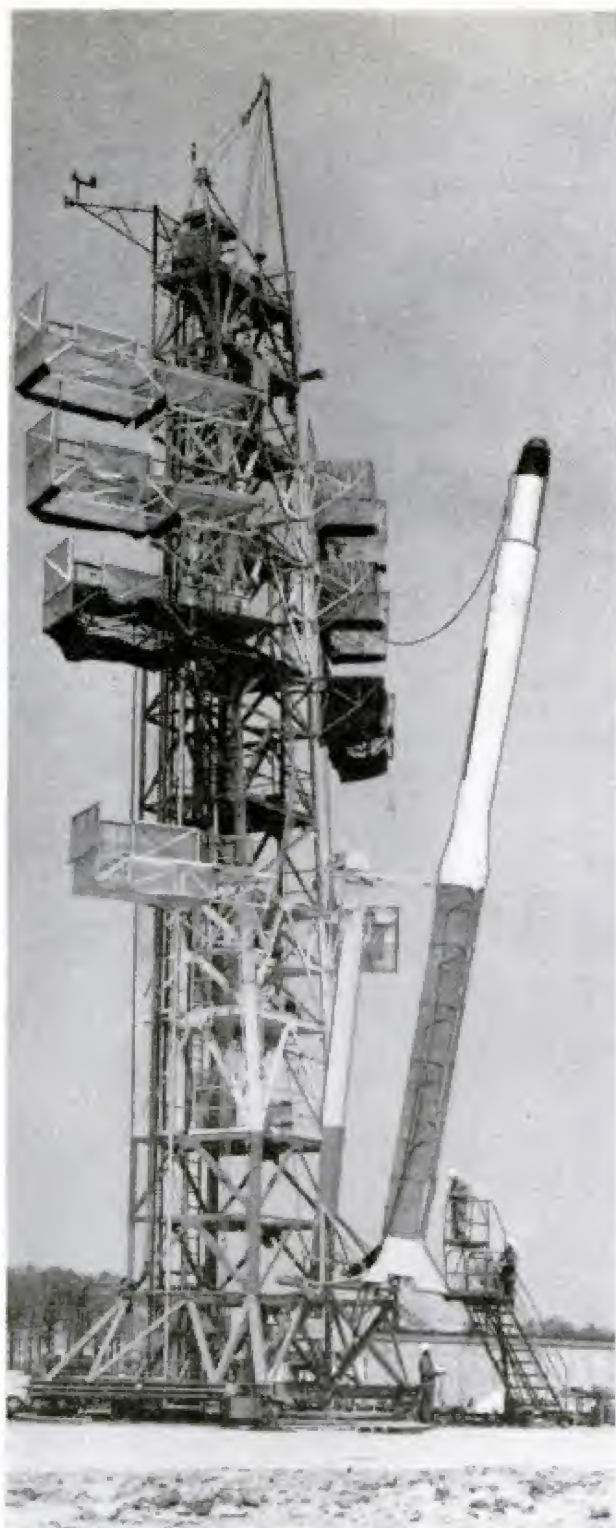
A dozen running steps and one strained leap placed him behind the two enormous

ears of an Army field radar unit. "Hey, Charlie," he shouted to the coverall-clad figure working at the launch pad 30 yards away, "you better get this thing off on time or you get no dessert today. The pies are due out in 20 minutes."

"Slow down, Cookie," the one-man countdown crew shouted back. "Everything's running on time, but we've got to wait for Mac before we can launch."

A third of a mile away, a World War II





**NEW** Gantries are no longer built from scrap lumber, without blueprints, on the spot

landing craft now masquerading as a truck-carrying ferry slid swiftly into the Wallops Island landing slip, slammed the retaining wall, bounced and crunched to a stop. As two roustabouts belayed hawsers heaved from the LCM, the ferry pilot jumped from the wheel house to the retaining wall, slid down to a waiting bicycle, threw a small black case and a camera tripod into the front basket and began pedaling rapidly toward the launch site.

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Fifty yards from the waiting rocket, Mac skidded to a stop, dropped the bicycle, flipped the catches on the black case and shouted toward Charley: "Sorry I'm late, I had to slow down for some fishermen." From the case he extracted a small, drug-store movie camera, mounted it atop the cheap wooden tripod, pointed the lens toward the rocket and yelled, "Okay, let 'er rip."

Charley, by now crouching 40 yards from the launch pad behind a knee-high sand dune—his protective blockhouse—waved toward a window in a nearby cinder-block building. "Now," he commanded, "let her go."

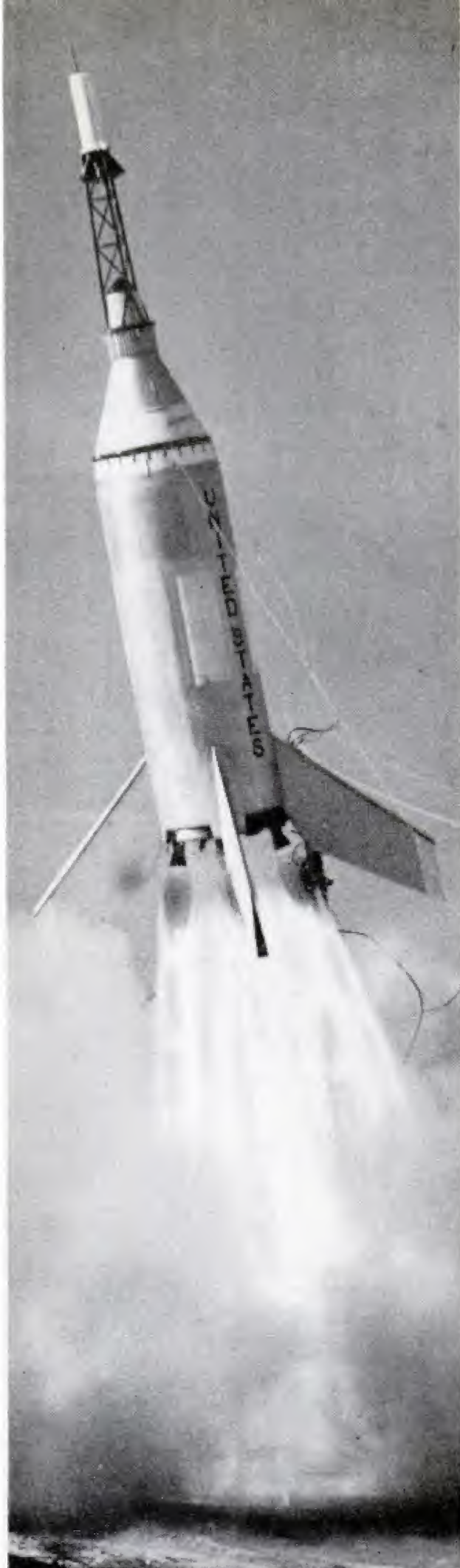
Inside the building the blade of a knife switch chopped down. At the base of the rocket a white puff appeared, and the rocket disappeared. Cookie pushed the large, padded doppler head phones tightly against his ears. Mac pressed the trigger button of his movie camera and listened to the whirring of the spring-wound motor. Charley glanced at his watch, then looked skyward just in time for the roar. It wasn't much of a roar. But it wasn't a squeak either, or a "pip" or a "phfft." It was just a little roar and it lasted five or six seconds.

Wallops Island never has made much noise, but it has made a steady, significant impression since its founding in 1945. The roar of the Space Administration's 8-engined *Little Joe* booster, for example, rising from the small launching center isolated on Virginia's Eastern Shore, is not so earth-pounding as the thunder from the *Atlas* missile that boosted John Glenn into orbit from Cape Canaveral. But, without the tests of the Mercury space capsule at Wallops Island there would have been no American orbit. *Little Joe*, the early Mercury capsule escape-system testing program, is but one episode in the long string of Wallops' claims to a fame that it does not seek.

At a wartime Wallops Island, hidden from public sight and mention, the old National Advisory Committee for Aeronautics (NACA) tested its designs for the first speed-of-sound airplanes. Wallops provided the engineering proof of Richard T. Whitcomb's now classic "area rule" that resulted in today's "coke bottle" fuselage shape, also called "Marilyn Monroe" and "wasp waist." When the supersonic B-58 was still under development, Wallops already was testing the revolutionary new bomb shapes needed for the *Hustler*.

Wallops crews ("rocket mechanics," they're called) pioneered aircraft research techniques that pushed aviation progress from the interesting to the fantastic. Wallops taught researchers to use Nature's





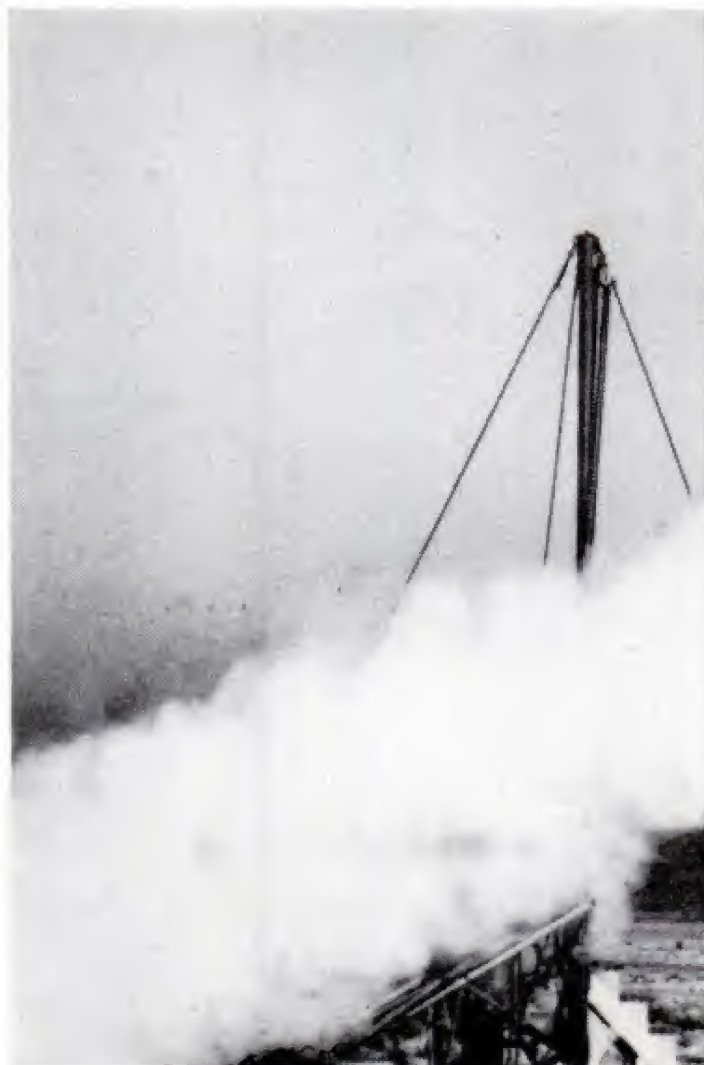
own vast outdoors as a controlled wind tunnel. When the NACA became NASA (National Aeronautics and Space Administration) in 1958, Wallops crews were already launching rockets at a rate of more than 250 per year.

Today, Wallops is probably best known for its conduct of the *Little Joe* program, and for development testing of the solid-propellant research rocket, *Scout*. Wallops' prime interest is in scientific research rather than in the development of rockets. When Wallops develops a rocket, it is only to provide its engineers with a vehicle on which to mount an experiment. Even while Wallops was assisting the *Scout* program, every opportunity was taken to use test firings as scientific experiments. For example, two test firings carried the *Explorer IX* and *Explorer XIII* satellites.

Among the station's early work with rockets and missiles, perhaps its most important project was *Bullpup*, the air-to-surface missile. Wallops has the Western world's claim to the first launchings of three-, five-, six-, and seven-stage rockets.



**NEW** "Little Joe" series, with large NASA funds, tests Mercury-capsule escape system







**NEW** Today, signs like this on tractor are all over Wallops. In old days, danger was largely ignored as men handled rockets with bare hands and secretaries watched launches through open windows

The first five-stage rocket was designed to climb to a high altitude and then fire again, this time directly toward the earth. This allowed engineers to examine the effects of high-speed re-entry into the atmosphere. Today, the *Trailblazer* program at Wallops uses a seven-stage rocket that climbs higher above the atmosphere and fires back down at greater velocity. Because of its potential military implications, few people witness most *Trailblazer* shots.

Its rise to fame and fall from fun started with the International Geophysical Year. It became known as a research center that could do things well, rapidly and cheaply. But the fame brought with it money, expansion and a new way of doing things. People at Wallops still double in brass and many still routinely work a seven-day week but, they wistfully reminisce, no longer does a cook dash from his kitchen to help with a launching.

**OLD** Early rocket tests, with hardly any funds, were made from makeshift launch pads that resembled hangman's scaffolds, but long series of successes brought attention, more money and a lot less fun







**OLD** Drugstore cameras recorded historic launchings at Wallops Island in early days, while plywood walls (near launch pad) protected cameraman and others in ground crew from rocket blast at takeoff

A dramatic indication of the way Wallops Island has grown recently is a look at the official budget for operating the Station. In 1958, the budget for the Pilotless Aircraft Research Station was \$3.3 million. Last year its budget was \$14 million. In the first few years of Wallops' existence, it operated with a permanent staff of 60. Now there are 400.

Until very recently, Wallops shocked visiting launch crews from Cape Canaveral—crews that had been largely trained by Wallops people. At the big Florida missile base, power cables that warm up nose-cone instruments and stabilize radio-telemeter frequencies prior to launching are held in place by a solenoid. They are disconnected from the rocket at launch time by pressing a button. And at Wallops?

### Ropes Versus Solenoids

The former oystermen who work at Wallops tied the cables to rockets with Venetian-blind cord, using slip knots. At launch time, a gentle tug would release the knot and the cables would fall to the ground. Solenoids have an embarrassing habit of refusing to cooperate just when TV announcers have their audiences sitting on edge. At Wallops, one engineer observed, not unsarcastically: "Solenoids? We've never had a piece of rope malfunction yet."

Cape Canaveral's equipment just for calibrating tracking radar prior to a launch is more expensive than the radar itself at Wallops. As for calibrating the radar, a Wallops technician would walk to the beach, face the Atlantic, raise a moderately priced rifle to his shoulder and fire a .22 caliber bullet of known velocity out over the water. The doppler-radar operator would track it for a few seconds and calibrate his unit according to sound changes.

Protective "blockhouses" were frequently the nearest depression in the beach. When protective walls were needed, rocket mechanics would turn carpenter to erect large sheets of plywood over two-by-four frames. Secretaries—the few that there were—could talk out of office windows to their bosses working on launching pads. Today, a runaway Scout engine could rip through the small cinder block buildings like a razor through silk.

"The good old days" at Wallops are not in the distant, hazily remembered past. They run right up to about two years ago when the major changes started coming about. Even today some informality remains for, although it is the oldest of NASA's rocket-launching sites, it is still a young installation.

Wallops Island thrives as a living, vital memorial to the birth of supersonic flight. Early in World War II there was neither need nor plan for flight at the speed of sound. The pace of *Blitzkrieg*—lightning war—was set by Stukas dive-bombing ahead of the *Wehrmacht's* tanks in Poland, and Messerschmidt ME-109's terrorizing the skies of Britain. British *Spitfires* and American *Aircobras* were fast enough matches. But as the war progressed, demands grew for aircraft with greater and greater speed.

By 1943, it was obvious that airplanes would soon be flying 600 to 800 m.p.h. But it was in this very range—the transonic range—that designers could not study models of their proposed craft. Wind tunnels operating slower and faster than the speed of sound were available, but none was reliable at the sonic speed itself. At that time, tunnels attempting to operate in the sonic region choked; slow air and fast air mixed, creating turbulence that made



accurate measurements in the tunnel impossible to obtain.

However, engineers at NACA's Langley Field (Va.) Aeronautical Laboratory had an idea. Soon, strange things were being done to the bombing range not far from Norfolk. Week after week the engineers put their idea to the test, modified it and retested. But they needed more room, as well as a location that would preserve secrecy. An isolated strip of sand on the

edge of an Atlantic coastal marsh just south of the Maryland-Virginia border was chosen. Oystermen from nearby Chincoteague called it Wallops Island. NACA called it the Pilotless Aircraft Research Station.

Early one morning in 1945 a B-29 stripped entirely of the bombs, guns and armor that earned it the name *Superfortress* was flying at well over 40,000 feet as it appeared near Wallops Island. The bom-

**OLD** Closeup shows old rinky-dink launching pad, scrapwood gantry and plywood blast walls



**NEW** Giant crane moves Mercury capsule into place, work formerly done by muscle power







**OLD** Radar equipment was calibrated by tracking .22 rifle bullet fired over the surf

bardier sighted on the marshland separating the station from the mainland and pressed his bomb-release switch.

Simultaneously, the switch released a long, thin bomb, and signaled waiting ground observers. Engineers tracked the bomb's fall with telescopes, radar and special radio receivers. The receivers caught and recorded messages from many kinds of sensitive instruments attached to the falling bomb-shaped laboratory. Transmitted to the ground was information on strain, flutter, balance, temperature and many other factors at every instant of the bomb's fall.

Then, shortly before the bomb reached the earth, engineers sharpened their alertness. Every action was calculated to be careful and accurate. For at this time the bomb was passing through the sonic region. Every reading came through with precision. When the bomb, traveling at 1000 m.p.h., plunged into the soft marsh, Engineers knew that Wallops Island had proven that nature's own wind tunnel could be used for high-speed aircraft research.

Many experimental models of famous aircraft were instrumented and dropped onto the marshlands surrounding the Pilotless Aircraft Research Center at Wallops. However, before long Langley Field had developed a satisfactory transonic wind tunnel. For a while there was talk of Wallops going out of business. Meanwhile, NACA had assigned Richard T. Whitcomb the task of using the new tunnel to prove his theories concerning the change of drag (and speed) as a plane approached the speed of sound. From his studies evolved the "area rule" that related size and shape of fuselage with size and shape of wings



**NEW** Ultramodern radar equipment costs more to calibrate than old radar cost when new

and tails. Incorporation of the area rule into aircraft design dramatically improved the performance of supersonic aircraft.

Whitcomb's theories needed tests beyond the wind tunnel before they could be tried in expensive, full-scale craft. Wallops was chosen. However, an airplane model dropped from even the highest flying B-29 would not achieve high enough speed for a long enough time.

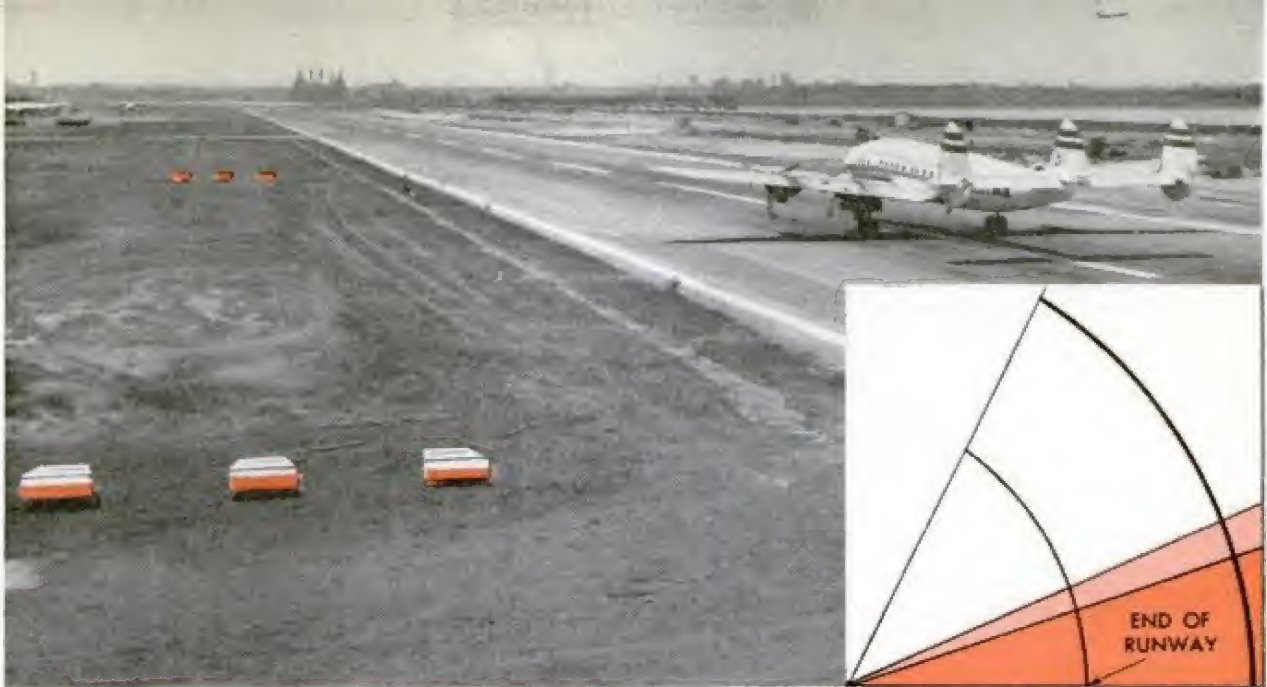
This did not stop Wallops mechanics. They simply mounted the small airplane models on the noses of rockets that *would* travel fast enough, long enough. As the models ripped through nature's wind tunnel, they telemetered the needed information back to Wallops Island.

This was the maneuver that put Wallops into the rocket business for keeps, and became a routine post-wind-tunnel testing technique. It was used for early testing of planes designed to travel above 1000 m.p.h.—above the limits of the bomb-drop technique—and later to test models of rockets and missiles. One early success was to improve the Convair F-102 jet fighter. As a result of studies made on models rocket-fired from Wallops, designers wasp-waisted the plane's fuselage and slightly lengthened the nose. The new F-102A was 25 percent faster than the F-102 and it outperformed the earlier model in all other important respects.

Most of this work was performed on a limited budget, sometimes on *no budget*. When Wallops technicians wanted a pre-flight-checkout wind tunnel for their models, they built one from scavenged materials. They produced a blow-down tunnel—one in which air is slowly compressed

(Continued to page 174)





## Aerial Traffic Light Guides Planes Down Safely

Two banks of lights at LaGuardia Airport, New York, give airline pilots a visual beam to fly down to the runway.

Each unit shows red on the bottom and white on top. If the plane is too high, the

pilot sees white from both banks of light. If he is too low he sees red from both banks. If he has the right glide path, he sees white from the near bank and red from the far bank.

## Flying by the Seat of His Pants

Blasting 350 feet into the air, a parachutist demonstrates a new British-made rocket powered ejection seat for high-speed jet aircraft. It is designed to allow bail-outs even under extreme low-altitude conditions.

## Every Trip's a Round Trip on This Road

Pounding with the force of 1000 trucks an hour, a highway test track is giving road materials as much beating in a week as they would get in a year on a road.

The 26-foot track is situated at the University of Illinois, Urbana, and rests on a tank 4½ feet deep to control drainage. To compare surfaces, various materials are placed on the track; all have the same subgrade and get the same pounding.

Traffic is supplied by a pair of truck wheels rolling on the ends of a steel girder which can be weighted to simulate passing pressures of 1000 trucks an hour.







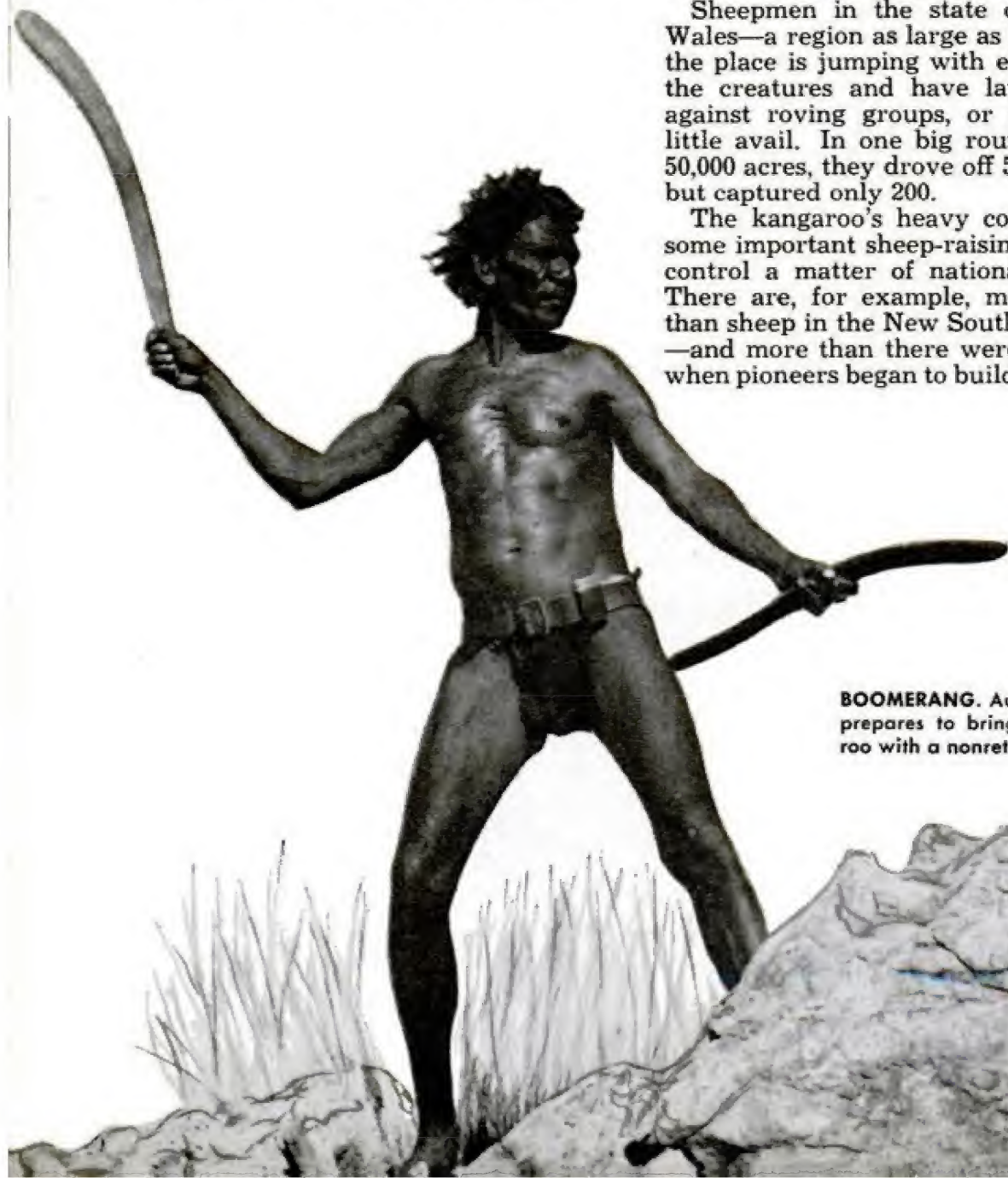
## ***BIG JUMP IN KANGAROOS***

**By Albert E. Norman**

**A**USTRALIA'S big kangaroo hunt is in its ninth year and, for all the luck hunters are having, it may run nine years more.

Sheepmen in the state of New South Wales—a region as large as France—claim the place is jumping with eight million of the creatures and have launched drives against roving groups, or mobs. But to little avail. In one big roundup covering 50,000 acres, they drove off 5000 kangaroos but captured only 200.

The kangaroo's heavy concentration in some important sheep-raising areas makes control a matter of national importance. There are, for example, more kangaroos than sheep in the New South Wales region—and more than there were 30 years ago when pioneers began to build up water sup-



**BOOMERANG.** Australian aborigine prepares to bring down a kangaroo with a nonreturning boomerang





***Despite a deliberate nine-year hunt, these strange and destructive critters are running in ever-increasing mobs***

plies and pastures. Kangaroos are adept at finding such good land and chewing it up.

More than 1000 miles from western New South Wales, in the northeast, the hill kangaroo also is threatening grazing. Hoping

under way in New South Wales with the red kangaroo. But until the full scientific report is in—with the means of control it may suggest—the problem is being met in more conventional ways.

Professional hunters often earn big checks for clearing larger properties. Some make up to \$200 a week in good times. Prices for good-quality hides have ranged from 75 cents to \$1.00 a pound; carcasses, sold for pet food, bring four to five cents a pound. Refrigerated trucks are used by hunters, and some of the meat finds its way to stores which, by law, may sell only

to understand the habits of this northwest marauder, the Wildlife Survey Section of the Commonwealth Scientific and Industrial Research Association has completed a four-year biological study of the group.

Investigators built corrals with rope nets around water points to trap kangaroos. The captured animals were then fitted with yellow collars carrying symbols on red reflecting tape. A spotlight enabled researchers to identify these marked animals in charting their nocturnal habits.

Automatic counters were set at watering points to check the number of kangaroos coming in to drink under cover of darkness. Surprisingly, it was found that even in mid-summer many kangaroos did not drink more than once in five days. This indicated they were capable of moving long distances from water in search of grazing and probably could subsist for long periods simply on the moisture from grasses. Such findings provide valuable information on the range of the kangaroo under varying climatic conditions. A similar long-term survey is



**RIFLE.** A hunter, one of several who earn up to \$200 a week, takes aim at one of eight million marauders





**ABORIGINE** in central Australia carries home a kangaroo after a food-hunting expedition. Meat is good eating

**KANGAROOS** graze on hills and plains. Marsupials, the young joeys are about an inch long when born



kangaroo meat. Many new settlers from Europe prefer kangaroo meat, and some shippers, seeking to tap this market at its source, have sent cargoes to Europe.

Unless the scientific surveys provide a new clue, the only effective long-term control of the mobs will be to establish the kangaroo as an economic animal and continue to develop markets for its products.

Americans prize leather goods made from kangaroo hide, according to Australian manufacturers, who admit they still must sell this idea at home. The leather is strong, thin, with high tensile strength—making it excellent for shoes, windbreaker jackets and other such items. The hides often are scarred from encounters with barbed-wire but when tanned these marks lend distinction and individuality to leather.

Large numbers of kangaroos are nothing new in Australia. Zoologists have established from fossils that mobs jumped around the continent some 200,000 years ago, and while that epoch saw the extinction of many other great mammals, the kangaroo has thrived to this day. So survival isn't its problem.

Australians also have an affection for these high-bounding creatures who, seemingly for the fun of it, may pace the occasional car they encounter, bounding along at 40 miles an hour. The kangaroo is permanently on Australia's coat of arms and is reproduced on the Australian penny.

So no matter how the country solves its kangaroo quandary, at least a reminder of that problem and of the strange creature that produced it will be around. ★ ★ ★



## Miniature Moon

Over 30,000 formations of the moon, such as craters and mountain peaks, can be studied on a new three-dimensional plastic model. The lightweight sphere is 12 inches in diameter.

With proper rotation and lighting, the moon's phases, craters, and mountains can be photographed to produce realistic pictures.

The half which is invisible from the earth is blank and can be used to record future information from satellites.

Made in three colors, the replica costs \$12.50 from Edmund Scientific Co., 101 E. Gloucester Pike, Barrington, N. J.



## Underwater Gardeners

Cooks aboard the Navy's nuclear submarines grow their own vegetables during those long underwater voyages.

Seeds are planted in flower-box type containers that are filled with a chemical-growth base. The light and heat sources are intense fluorescent lamps placed over the hydroponic gardens.

How long does it take to get results? With love and tenderness, ruby lettuce can be produced in about three weeks, dwarf peas in four weeks and carrots in about a month.



## Portable Mineral Light

Operating on either a.c. (110 volts) or d.c. (6 volts), a fluorescent light for locating and examining minerals is supplied in kit form and can be assembled by the owner.

Adaptable for field or laboratory use, the unit is said to be the first compact mineral light combining both long and short-wave ultra-violet.

The kit, which can be put together with a screwdriver, is listed at \$19.95 by the manufacturer, Ultra-Violet Products of San Gabriel, Calif. The portable power-pack adapter designed for use in the field is \$14.95.







# I CHASED A BOGIE IN A NORAD JET

By Kevin V. Brown





**I**T ALL BEGAN with a blip on a screen in a lonely radar outpost near Sioux Lookout, Ont., about 150 miles north of the Canadian border.

The blip wasn't there before, and it appeared in a place it wasn't expected. Because it did, it set in motion a chain reaction that involved hundreds of men, many millions of dollars worth of equipment and the security of the North American Continent. It also brought



# DETECT . . .

## IDENTIFY . . .

### INTERCEPT . . .

The blip detected at Sioux Lookout is relayed to Duluth for identification . . .

When it can't be identified,  
the intercept mission begins . . .

into focus the mission of a defensive network that is spread over two nations and three oceans.

Finally, it took me higher and faster than I had ever been—past the speed of sound and nearly 10 miles above the earth.

I flew a mission with NORAD.

The North American Air Defense Command (NORAD), the joint Canadian-American military system for guarding against manned attack over the top of the world, consists basically of three lines of defense. The first, longest and farthest north is the familiar DEW line (distant early warning), a radar screen manned by the U.S. Air Force along the northern coast of Canada and Alaska which looks for targets far out into the Arctic. Its flanks are extended into the Pacific and Atlantic by U.S. Navy radar aircraft which fly between the Aleutian and Midway Islands and between Greenland and the British Isles.

South of the DEW line is the Mid-Canada line, an east-west line across Canada about

**AUTHOR WINCES** as he is squeezed into pressure suit before mission. He calls it "custom-made coffin"



**1** Identification officer studies code of new blip north of Duluth. Note outline of Lake Superior

half-way down from its northern border.

The third line is the Pinetree system of radars, which straddles the Canadian-American border and is operated jointly by the armed forces of both nations. This line is divided into regions and each region is divided again into smaller sectors for purposes of defense.

It was in one of these sectors—the Duluth sector of the 30th NORAD region—that our mission was flown. It covers parts of Minnesota, Wisconsin, Michigan and Ontario.

Like all NORAD sectors, the Duluth sector has radar to detect all aircraft flying within its boundaries, computers that store information on which aircraft have been authorized to fly within these boundaries, supersonic fighters to intercept those that cannot be identified, and missiles to destroy those that are identified as hostile.

This is the NORAD mission, to detect all aircraft, to identify them, to intercept the unidentified and, if necessary, destroy them. At this writing, of course, no aircraft have had to be destroyed, but virtually every day several have to be intercepted and given an "eyeball" identification.

I flew on one of these intercept missions, and it all began with that blip. . . .

## DETECTION

The Duluth sector is spotted with radar sites that sweep the skies and overlap one another. Radar specialists sit in semidarkness, staring at scopes, waiting for new blips to appear, watching the old ones follow their planned courses.

The blip that started my mission appeared at the top of the scope of a radar console in an Air Force station at Sioux Lookout. It was easily interpreted as a high-flying jet north of the site and heading south, toward Duluth and Minneapolis. It





**2** When blip can't be identified, scramble button is pushed (inset), alerting pilots. Planes are actually flown by this weapons team consisting of Canadian intercept director (left) and American technician

alerted the specialist because no flight plan had reached him calling for an aircraft at that spot at that time, nor had any warning of an unidentified aircraft come from either the DEW or Mid-Canada lines.

What was it, and how did it get there?

The jet's location, speed and altitude were relayed to sector headquarters. . . .

#### IDENTIFICATION

Sector headquarters is a massive windowless building with walls four-feet thick, located at an airbase on the outskirts of Duluth, Minn. Inside are the men and equipment that process and control the operation of the entire sector. In the bowels of the building are giant computers—the brains of the system—which, with astro-

nomical speed, receive, store, correlate and answer questions on all data fed into them by radar sites, air bases, guided-missile stations, the DEW, Mid-Canada and Pinetree lines, flight-control centers and weather stations. They memorize information on weather conditions, the status of jets and missiles, projected flight plans of all aircraft authorized to fly through the sector, and tracks of all aircraft now flying through the sector, authorized or not.

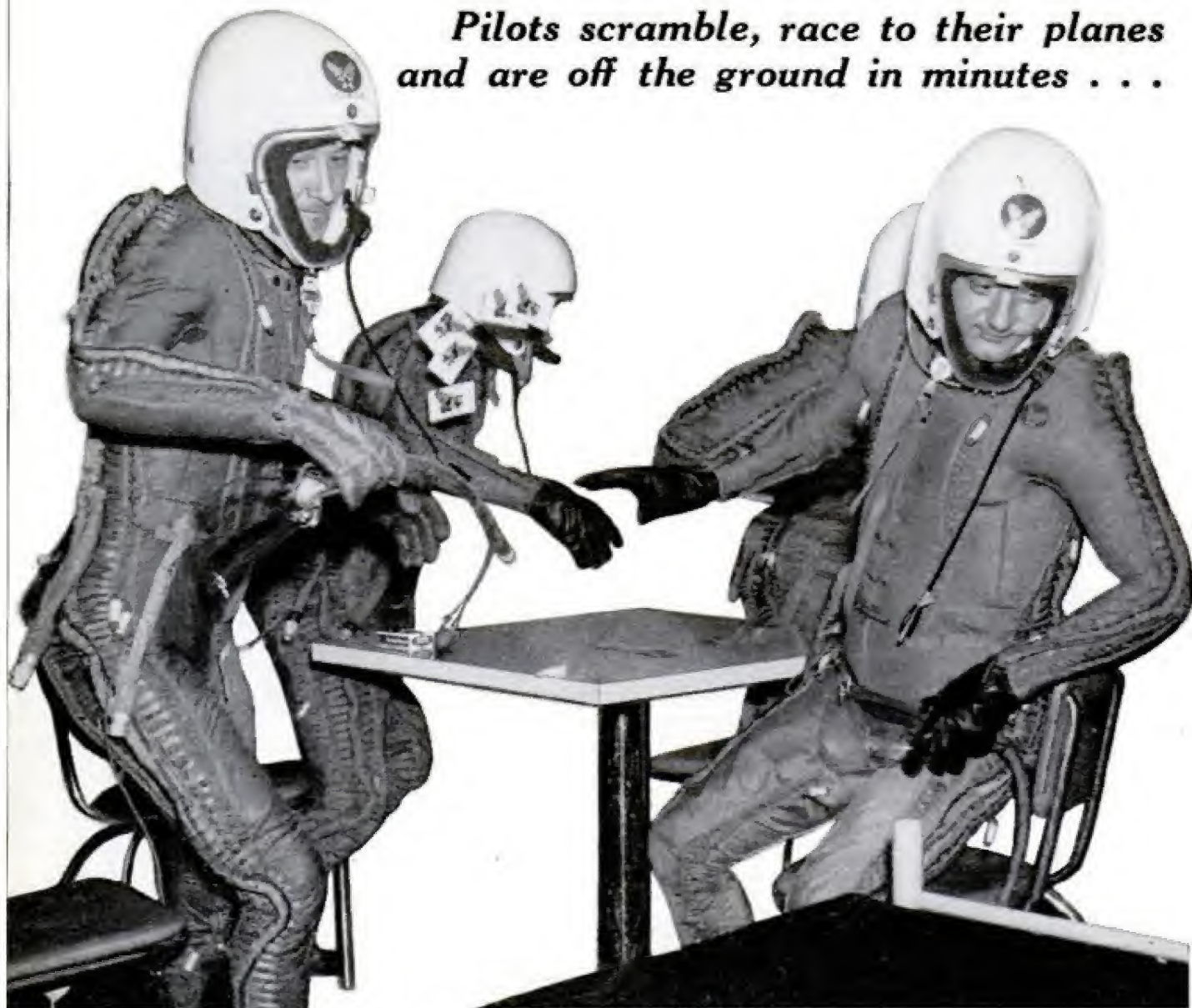
The report on the blip from Sioux Lookout came into the computers, and the data was automatically relayed, in code form, to scopes in the identification room. The identification officer (IDO) already knew which planes should be flying where at what time. This new track was a stranger.

**3** Senior officers, Canadian and American, observe battle progress from two-story command center. On large-scale missions, they deploy forces from here. Huge screen, lighted chalk boards keep running account





*Pilots scramble, race to their planes  
and are off the ground in minutes . . .*



**4** Cards fly, chairs tumble as scramble horn sounds down on flight line. Skinned shins are occupational hazard here, as pilots have five minutes to get planes airborne. Bed (foreground) is for night alerts

Reaching for his light gun, an electronic device that triggers responses from the computers, he aimed it at the blip and fired. There was no flight plan.

The IDO picked up his direct line to the Winnipeg (Man.) flight-control center and gave it the location and altitude of the jet and the direction and speed of its track. Winnipeg replied that no flight plan had been filed corresponding to that track.

The IDO, 30 seconds after the track appeared, signaled the weapons room that it had an unidentified aircraft.

In the weapons section, lights flashed and bells rang on the console of the senior weapons director. This, too, was superfluous insurance, because he had already seen the track and translated its code. By the time he received the IDO's signal, confirming it as an unknown, he had selected a weapons team to direct the mission. A radio frequency was assigned, the scramble button

was pushed and the horn went off in the pilots' ready room. . . .

**Meanwhile, on the flight line. . . .**

My day began early that morning. Pilots of the 11th Fighter Interceptor Squadron—those who are not on 24-hour alert—report for duty at 7:30 a.m. So did I. After passing the security check at the gate, I was escorted to squadron headquarters by Lt. Bernard Hartman, one of the 11th's jet pilots.

In the squadron lounge, I met the rest of the pilots, including the man who was to fly me, Capt. Charles Pugh. A few of the others told me, not in his presence, that Pugh was "a damn good pilot." In Air Force language, it means the same thing it does in any other language.

After coffee at the snack bar, we went into the briefing room. At these morning sessions, the day's activities are outlined. I

(Continued to page 178)





- 5** Pilot and author climb aboard, with Lt. Hartman manning the ladder. Pilot must get strapped in, start engine, call tower, get instructions, taxi out and take off, all at top speed. Author just sat and sweated
- 6** F-106 roars along runway on takeoff. Minutes later it met bogie, 45,000 feet and more than a 100 miles away. Most NORAD scramble missions, from initial detection to interception, take less than 15 minutes





# WHAT'S NEW FOR Your Home

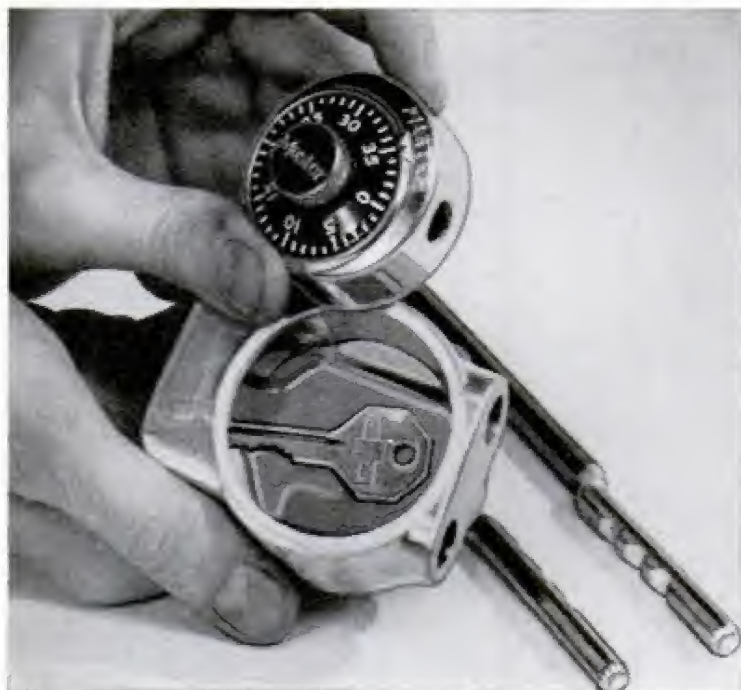


**BATTERY-POWERED MOWER** adjusts to one of five cutting heights, raising blade from 1 to 2¾ inches without changing wheels. Height is set from handle; operator's hands never come near blade. Price: \$125; Lambert Inc., 519 Hunter Ave., Dayton 4, Ohio



**LOCKING UTILITY CABINET** stores, protects, transports contents. Has chip-proof finish, steel frame, plastic divider drawers, costs \$7.50. Akro Mills, Akron 9, Ohio

**HOUSE KEY IS SAFELY STORED** behind combination lock in a polished aluminum box for family members only. Hasp handle locks to door knob, grille work, pipes. Available for \$4.95 plus 20 cents tax from Co-Op Lok, Box 3147, San Jose 27, Calif.

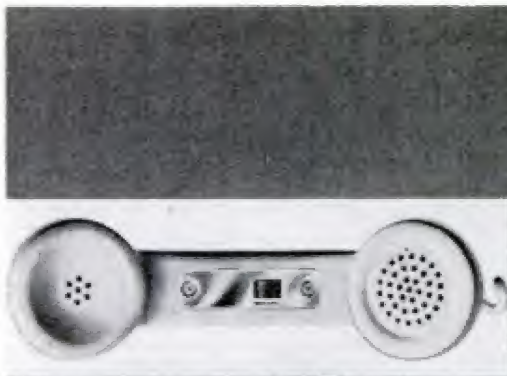


**PORTABLE GARBAGE DISPOSER** sits over sink drain; stainless-steel shredders grind scraps into small particles for flushing down drain. Costs \$60; General Electric Co.





**HEAT AND COLD** are supplied by reusable pack. Costs 98 cents. Royal Super Ice Co., 7325 San Leandro St., Oakland, Calif.

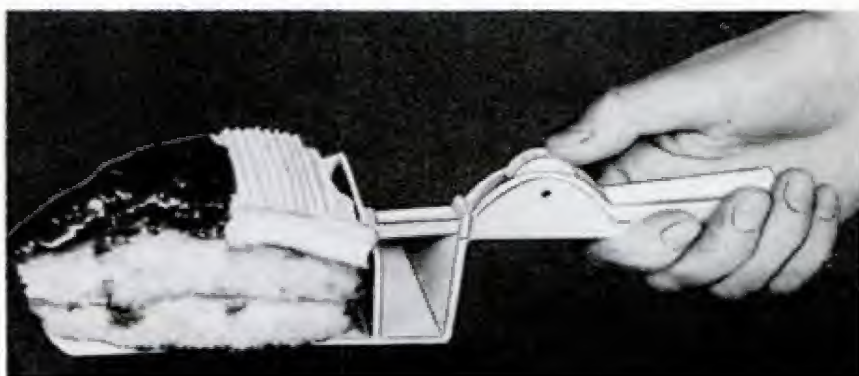


**VOLUME-CONTROL RECEIVER FOR TELEPHONES** fits on any modern phone. Designed for people with impaired hearing, the unit has a tiny control in handset that lets anyone adjust the loudness of the incoming calls to the best listening level. Available from Bell Telephone Co.

**TOUGH CARPET TILE** for heavy-traffic areas (including golf club-houses) is made of used tires from trucks and buses. The tile can be installed indoors or out. The foot-square tiles are made by Futurus, Inc., 1076 W. 9th St., Upland, Calif.



**PLASTIC SERVER SLIDES** cake or pie onto plate, neat and upright, when thumb dial is rolled. Costs \$1.25; Hollis Co., Dept. CS, 1133 Broadway, New York 10







## Taped TV (Sort Of)

Television pictures shot by a new Westinghouse TV camera tube can be stored on consumer-type tape recorders. They can be sent over telephone lines, or transmitted via two-way radio, such as from a mobile station to a fixed home base. Using slow scan television, the picture changes once every eight seconds. The standard rate of change for motion pictures is 16 times per second.

Where monitoring of a constantly changing scene is not important, the system can have great application. It could be used, for example, in storing rarely referred to documents on tape, or using phone lines to transmit them from a storage area to an office.



## Hand Woven Dome

Resembling an inverted basket, a 72-foot-diameter dome has been built by design students at Southern Illinois University. The dome, representing a new construction principle, is called a Basketry Tensegrity Geodesic Dome.

The unskinned framework is made of 340 pieces of interwoven fir two-by-fours joined with bolted metal plates. The five-story-high dome has been safely subjected to a 750 pound static load test. Such structures, for shelter purposes, can be built with minimal manpower and material.



## Hang-Over Helps

Mechanics can easily get right on top of a job by crawling up on Hang-Over. A support platform that slides under the hood and over the fender of a car or truck, it allows easy access to the entire engine compartment. The front top support contains a tool tray.

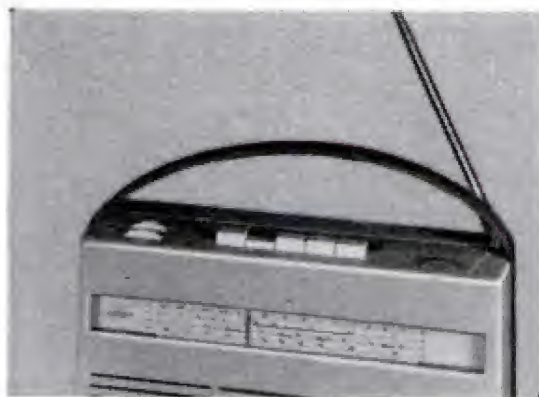
Constructed of tubular steel or aluminum, Hang-Overs are collapsible with height adjustable from 21-55 inches. The larger truck model extends to 72½ in. Hang-Overs are priced from \$54.50 to \$72.50 by Hinckley Myers Co., 28051 Mound Rd., Warren, Mich.



## PM Shopping Guide

# Transistor Radios

By Byron G. Wels



**TILTING ANTENNA** is important feature on an FM-AM unit to insure proper alignment



**RAISE SET FROM COUNTER**, squeeze lightly and shake. Set should perform well without interruption. This one's battery contacts cut out when squeezed, contacted again when released



**SOUND MAY INCREASE** or decrease when set is grasped with hand. Raising set away from counter should not cause any additional alteration in volume or sensitivity, however

**S**IMPLE TESTS and inspections you can perform in the store will tell you a lot about any transistor radio you want to buy.

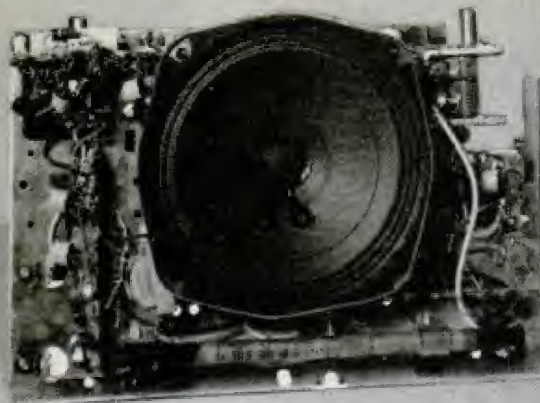
And the way in which the salesman demonstrates radios for you may tell you even more! As PM editors found, in doing test shopping for this article, there are tricks used by some radio salesmen which can make any transistor radio sound better—or worse—than it actually is. Salesmen may “push” a particular set for a variety

of reasons. Most will do it openly in their sales pitch; a few will use unethical methods.

One store we shopped had a \$1.98 transistor radio prominently displayed in the window. We asked the salesman to show it to us. As he removed it from the shelf in its glass display case, he switched on a fluorescent light inside the display case. Then he set the radio on the glass counter and turned it on.

The static crackle from the little





**GRILLE SIZE** does not always indicate size of speaker! This speaker though is larger than most

set was painful—as it would have been from any radio placed that close to an operating fluorescent light!

We asked to hear another set which didn't have so much static. The salesman smiled obligingly and brought out a more expensive set. But before he turned it on, he carefully switched off the fluorescent light. The more expensive radio sounded fine—and had practically no static.

The moral? Listen to a radio set away from any nearby fluorescent lights which are operating.

### The Magic Coil

In another store, we were shown a small transistor set which, from our knowledge of radio, seemed to be performing miracles in terms of sensitivity and selectivity. As we bent down to give it a closer look, we noticed a length of wire coiled round and round under the metal edge of the display case. Such a remote antenna or signal sucker would have

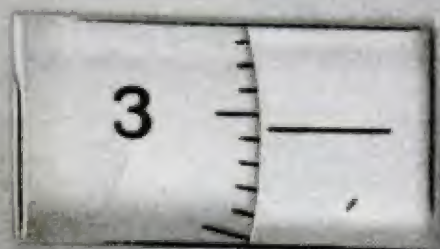
made almost any radio sound good!

The moral? Move any set you want to listen to away from the store counter.

Here's another trick tried on us in one large and impressive-looking radio store. When we asked to see an AM-FM radio, the clerk brought out two competitive brands whose prices were very close. Yet one sounded far superior to the other, for reasons which we couldn't determine by looking at them. We identified ourselves to the clerk, told him the reason for our visit, and asked him to explain the difference in performance. After making us promise not to use his name, he explained that the store had overstocked on the set that sounded so good. He received a bonus for each one he sold. So he made sure that fresh batteries were placed in the "bonus" brand each day. He didn't worry quite so much about the other set!

The moral? Make sure the batteries

**TRY READING DIAL.** Radio at left uses easy-to-read scale while unit on right is harder to reset to same position. Check also for Conelrad markings and vernier action, both important





in sets you listen to are new; if they are the same type, have them transferred from one set to another.

Those are, unfortunately, some of the tricks of the sales trade. Here are other important performance points you can check right in the store:

**Listen testing.** To compare the sensitivity of several radios, tune them all to the same *weakest* station the best set will receive. A good set will pick up weak stations; a poor one will not receive them, no matter what the volume setting.

Next, tune to weak stations and rotate the set. Should fading occur, the set lacks good AVC (automatic volume control). Don't fall for sales talk about "directional antennas." You aren't buying a direction finder in this case, and if you were, you would want a far more accurate one than you can obtain in a low-cost transistor radio.

Check for distortion at high volume levels, a sign of an under-rated speaker. The sound should always be clear, crisp and not garbled.

On AM-FM units, check for distortion as before, but switch to FM and listen for a telltale howl or squeal (feedback) or a steady pop-pop-pop ("motor-boating"). These are signs of either faulty components or wiring.

#### Sales "Volume"

Some sets use the "S"-taper volume control, which provides an impressive blast of volume with just a slight turn of the control knob. From there on, volume increases very little. It's easier to live with a set that gives you a steady volume increase over the full range of control.

**Is tuning precise?** For station pin-

**HOW EASILY** can you effect battery change? Set at left requires screwdriver to remove back (some parents prefer this!). Coin opens set at right and captive screw stays with cover



**TONE CONTROL** (top) is almost mandatory requirement on FM unit. Good OFF indicator (bottom) will save battery replacement. Radio at left, simply clicks off or on, no additional indication is provided other than relative position of black dot on control (it's OFF here!). Unit at right provides window which reads OFF when unit is off, and red color fills window when set is left on





SAME SIZE CASE but unit at left has much longer antenna core. This will result in greater sensitivity, selectivity. Core thickness is not as important as its length



**INTERMEDIATE FREQUENCY** transformers are in shielded cans. Larger ones, left, are easier to set accurately, therefore, usually perform far better with much less trouble

pointing, the tuning dial should be easy to read and the tuning control should be a vernier type. This simply means that one full turn of the knob does not equal a full rotation of the dial scale.

**How many transistors?** The number of transistors is not nearly as important as the grade of transistors used. The very best transistors (Mil-Spec) go into military and laboratory equipment where accuracy and output are critical. Units that are acceptable, but not quite as good as Mil-Spec transistors, are sold as commercials (called Grade "B") and are

## WHAT THE SPECIFICATIONS SHEET TELLS YOU

**CIRCUIT:** This tells the number of transistors and other semiconductors and what their function in the circuit is. "Superheterodyne" circuits generally provide better selectivity and sensitivity than "TRF" or "regenerative" circuits. Superhet circuits use IF (intermediate frequency) and converter stages, and the more IF stages, the greater the selectivity.

**TUNING RANGE:** 550 to 1600 kilocycles (kc) is the AM broadcast range; if you want to receive a full range of stations, your set should cover this band. The FM range is 88 to 108 megacycles (mc). Short-wave bands may include any frequencies from 1.6 mc to 30 mc. Frequencies below 550 kc are for marine radio and weather.

**OUTPUT:** Output power is stated in milliwatts and usually two figures are supplied. One is called "undistorted" and the other "maximum." The higher these ratings are, the better. The greater the percentage difference between the two, the safer the undistorted rating will be. For example, 280 mw (undistorted) and 560 mw (maximum) will give better performance than 70 mw (undistorted) and 100 mw (maximum).

**SPEAKER SIZE:** The larger the loudspeaker is, the better its bass response will generally be. However, a 4 x 6-inch elliptical speaker should be about as good as a 5-inch round speaker, as it is cone area rather than diameter that is important in determining listening quality.



used in most transistor radios. Transistors that don't work at all, are, of course, rejected as "duds."

There are also marginal transistors called "culls" that operate, but not very well. It might take at least two "culls" to do the same job as one good Grade "B" transistor. That's why some 5-transistor sets could conceivably outperform some 9-transistor sets. Since there is no way for you to tell in the store how good the transistors are, listen to the set instead of counting the number of transistors.

**The inside story.** Busy salesmen may be reluctant to show you how to open the back of a small radio, but it is usually an easy job, and you are entitled to know how to change batteries!

The battery compartment inside should be of an acid-resisting material and the battery polarity should be clearly marked. It should be easy to replace batteries.

Mercury batteries will last two to three times longer than pen-light cells of the same voltage and size, but remember that mercury cells cost four to five times more.

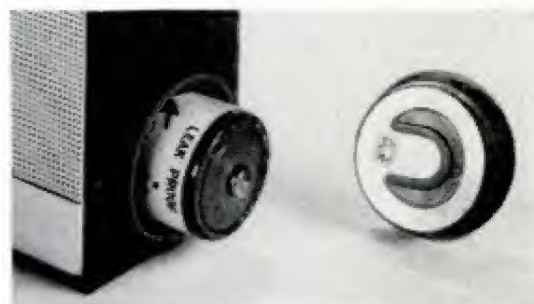
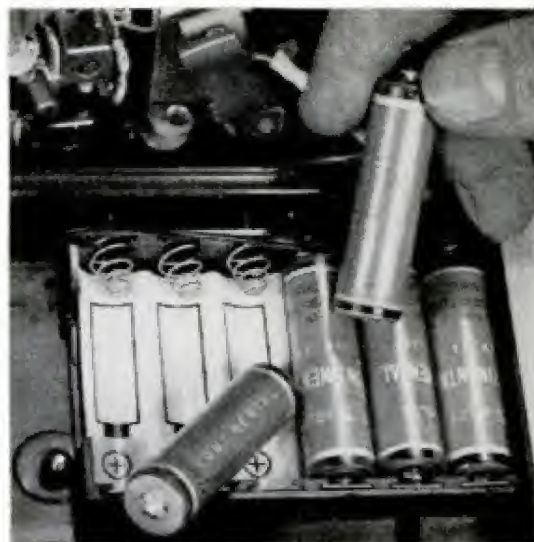
Look at the ferrite antenna inside the case. While a short, thick core is more desirable than a short, thin core, neither is as good as a long core.

#### Antenna Should Tilt

If the set has a short-wave, marine or FM band, it needs an external antenna which can be tilted directionally to insure proper alignment for good reception.

Ask the salesman to show you the specifications sheet on any radio you want to buy. Check the model number on it with the number on the radio you are examining. The table on page 122 tells you the important points to look for in a spec sheet, and what they mean in terms of performance.

Although you can buy transistor radios built into desk sets, bottles, or even clocks, and in a wide variety of shapes and sizes, the basic tests outlined here are valid for any type. You can't, of course, put a big AM-FM short-wave unit in your shirt pocket. By the same token, hi-fi music may be hi but it won't be very fi coming through the little two-inch speaker in a shirt-pocket radio. Your common sense would tell you as much. It



**BATTERIES** should be easy to reach, easy to change. Compartment should be acidproof to protect circuit in case of battery leak. Markings (top) prevent incorrect installation

will also tell you to consider the extras you buy in the price, such things as a leather carrying case, earphone, or a.c. adapter.

Some sets provide facility for plugging the antenna from a car radio into the portable set, an additional feature which can increase listening pleasure.

But the important thing to remember in shopping for a transistor radio is to make sure its basic performance will be satisfactory. These checkpoints will help to guarantee satisfaction. ★ ★ ★



## SHOP AND CRAFTS

# HOW TO MAKE TURN AROUND SKIS



*You'll get almost as much fun out of making these turn arounds as you will out of skiing*

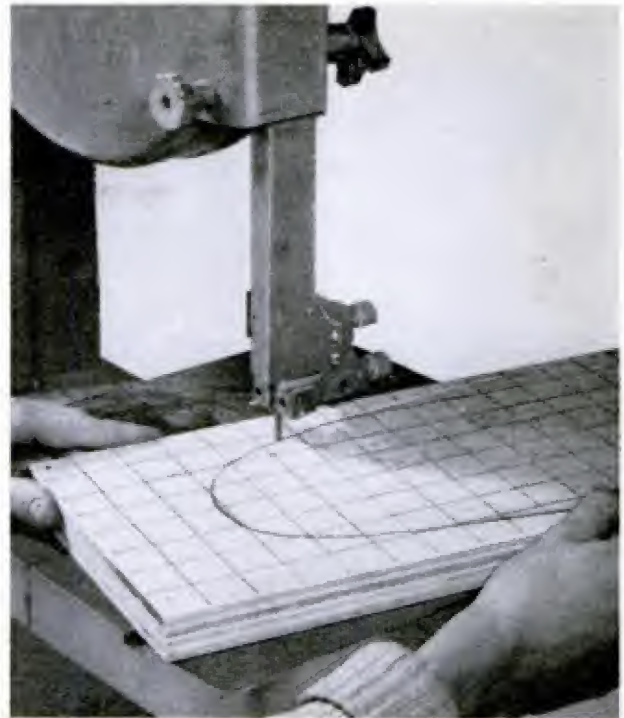
**By Jackson Hand**

**L**OOKS EASY, doesn't it? But there's more to turn around water skiing than meets the eye. You need a keen sense of balance, good physical condition, the ability to "ride" backwards and the ability to swim like several kinds of fish just in case the skis flip you into the drink on the first few tries. And then there's the skis. They're different. They're symmetrical in shape and bend. They turn up equally at both ends, are shorter and wider than regular water skis and have no keels or fins.

Details and pictures on the following

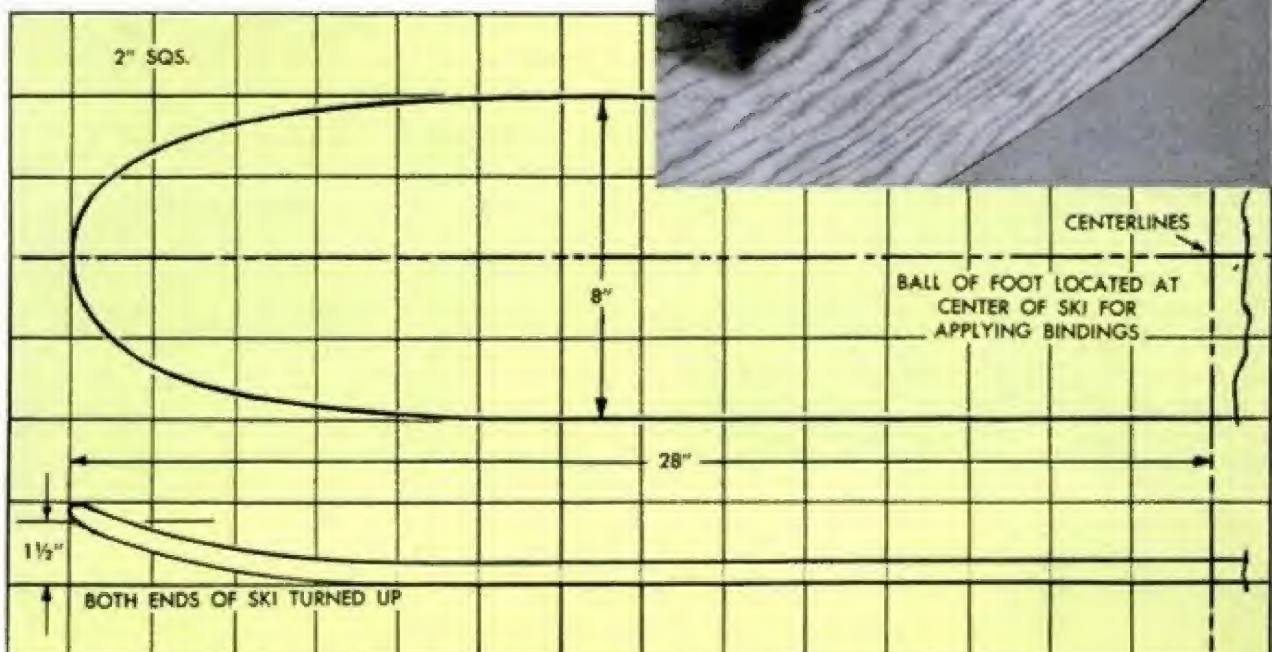
pages give you a good idea of the construction. To make each ski of a pair you laminate two  $\frac{1}{4}$  x 8 x 56-in. lengths of marine-grade fir plywood. Lay out and rough-cut the two pieces about  $\frac{3}{8}$  in. over these dimensions so you have something to work with when finishing to final size. Next steam, boil, or soak the pieces in very hot water for about a half hour. Then apply waterproof glue to the joining faces, clamp together temporarily and drive several screws in the waste near each edge, spacing the screws evenly each way from the





**NAIL TWO STRIPS** of plywood together, nails in the waste, lay off the pattern on squares slightly over-size, then bandsaw to pattern line as pictured above

**AFTER LAMINATING** strips, plane to the finish dimension and round the edges slightly. Then sand both the edges and flat surfaces smooth for finishing







**BENDING JIG** can be made from 2 x 4s and the whole thing, with ski in place, is clamped in the bench vise



**STEAMING** can be done with large cake pan, placing only end of ski over pan. Cover with folded towel

**BINDINGS** should be attached with flat-head brass screws. Countersink the screwheads exactly flush



center of the pieces. Now remove the temporary clamps and clamp immediately in a bending fixture made like that pictured at the top of this page. While the pieces are in the bending jig, join them with  $\frac{5}{8}$ -in. copper tacks spaced about 2 in. apart. Clinch the tacks against a metal dolly as shown. Allow the glue and wood to become thoroughly dry before removing from the jig.

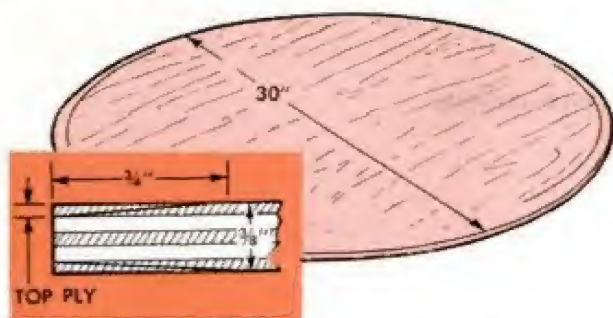
Turn the screws out of the waste and plane down to the dimension lines. Sand the edges smooth and round slightly. Sand the flat surfaces smooth, then apply boat enamel, in your choice of color, without an undercoater so the first coat sinks deep into the wood. Then apply successive coats of enamel, sanding between coats. Finally drill holes and apply the bindings. Finish with a final coat on the bottom of each ski to seal the screw heads. ★ ★ ★

**NOTE IN DETAIL** on preceding page that bindings are located so that ball of foot is at center of ski





# Slippery Sport of Sand Skimming Catches on in California



**SAND SKIMMING** is one of the latest beach sports in Southern California. All you need is a skimmer board, a long stretch of sand covered with a thin layer of water (as after a receding wave) and the sense of balance of a ski jumper. Just run toward the wet area, throw the board flat on the sand ahead of you and hop aboard. The thin film of water reduces friction to a minimum, letting you slide for 20 or 30 yds.

You can make a high-speed skimmer board from a circular piece of  $\frac{3}{8}$ -in. marine plywood. Most children's boards are 30 in. in diameter. However, add an extra inch for each 20 lb. the rider weighs over 100 lb. Thus, a 140-lb. person would require a 32-in. board, a 160-lb. rider a 33-in. board.

After cutting the board to the proper diameter, smooth the edge with a wood rasp or coarse sandpaper. Then bevel the edge on both sides for  $\frac{3}{4}$  in., leaving a taper that just reaches through the first ply at the edge of the board. Sand this bevel smooth with fine sandpaper.

Covering the board with Fibreglas not only improves performance but provides a hard, smooth and lasting finish that will be impervious to water damage. You'll need 2 yds. of 10-oz. Fibreglas cloth about 36 in. wide, a quart of resin and resin hardener. For clean-up, get a pint of acetone.

Do the bottom first. Cut the glass cloth into two 36-in. squares and prepare enough resin to cover one side of the board. At 75 deg. F., you'll have about half an hour after



adding the hardener before the mixture starts to set up. Using a stiff, clean brush, apply a generous coat to the bottom and edge of the board. Lay the cloth directly on the wet resin, smoothing it flat and brushing more resin over spots not thoroughly saturated. Pull the cloth up over the edge even with the top, cutting as necessary to avoid wrinkles. Be sure to work out air pockets. When the bottom is dry, use coarse sandpaper to trim excess cloth at the top edge. Feather the edge and sand off any lumps of resin which might have dried on the top, then glass the top.

To obtain a perfectly smooth surface, give the board a second coat of resin. Brush this on generously, leaving no dull areas in the wet resin. If you find that the top is too slippery, do as the surfers do and rub it with paraffin wax.

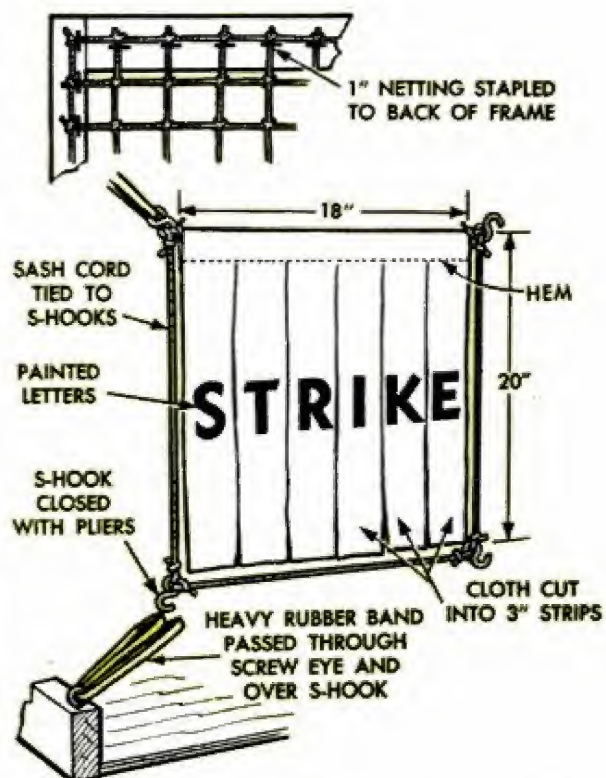
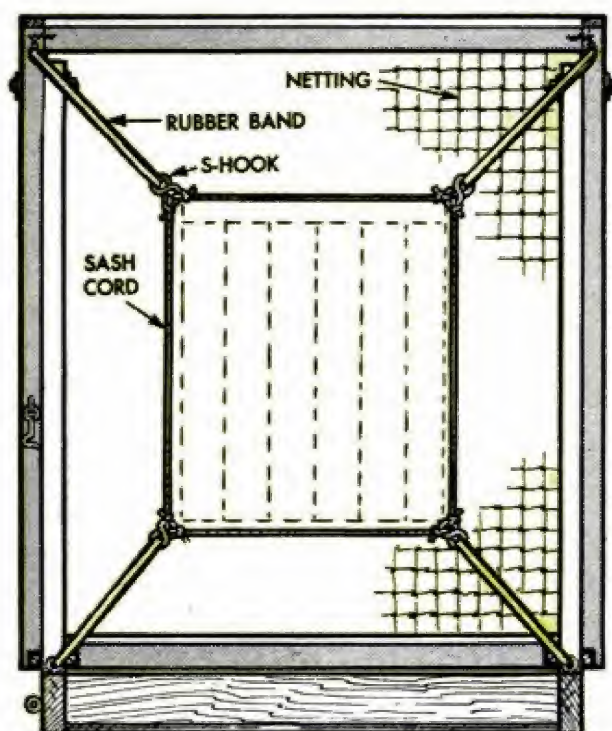
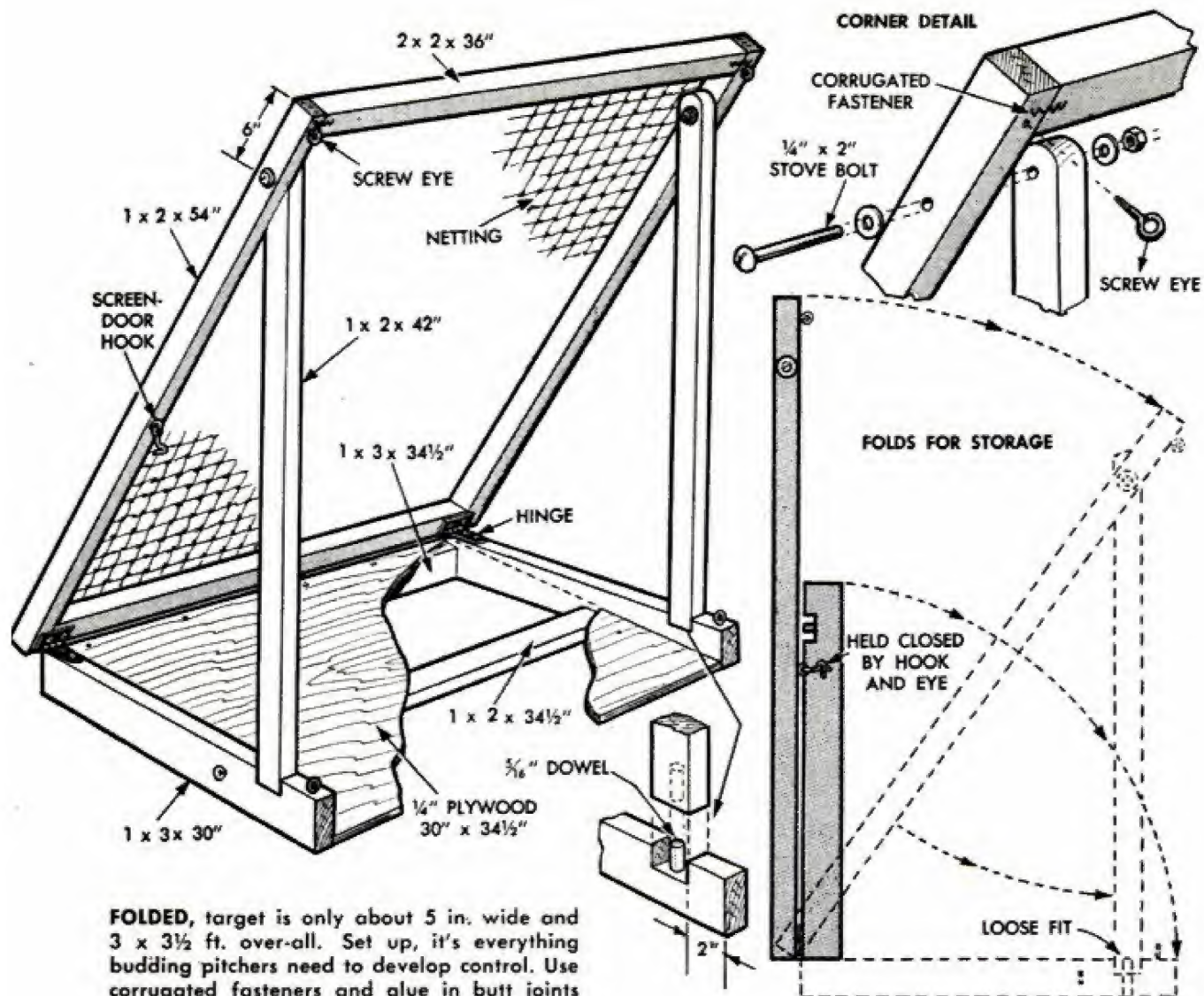
## Windscreen for Camp Stove

You'll be able to cook meals faster on a portable bottled-gas stove if it is protected by a simple three-sided windscreen. Made of three squares of scrap plywood or hardboard, it is assembled with hinges. The screen is free-standing when open but folds flat for easy carrying.

If you want to build a deluxe version, try gluing sheets of aluminum foil to the inner surfaces of the screen. The aluminum will reflect heat inward toward the cooking area.—*Robert Hertzberg*











# PITCHING TARGET

By Frank N. Stephany

**L**UCKY ARE Little League pitchers on the way up who get their rudimentary training in front of this home-built pitching target. It separates the good from the bad pitches, helps develop control. Set up on a driveway, it returns the ball after each throw, and folds into a compact bundle for handling and storing.

The backstop, detailed on the opposite page, is a rectangular frame of 1 x 2 and 2 x 2 stock over which a netting is tacked. This can be a section cut from a discarded badminton net, a fish seine, or you can use 1 x 2-in. welded-wire mesh. The backstop is hinged to a base made from 1 x 2 and 1 x 3 stock. This frames a piece of 1/4-in. plywood which inclines from full frame height at the back to ground level at the front edge, and serves as the ball return.

The backstop is supported in position for use by two folding legs, the lower ends of which drop into notches cut in the frame side members. Note that a hole is drilled

in the end of each leg to set over a dowel. The holes in the legs should be 3/8 in. in diameter to take the 1/8-in. dowels loosely. The latter hold the legs in position when the backstop is struck by the ball. The ends of the legs should also be a loose fit in the notches, otherwise they will be difficult to insert and remove. Hooks and eyes could be used instead of the dowels.

The target consists of a rectangle of fabric (light canvas will do) hemmed at the top edge, lettered with the word **STRIKE** and then cut into strips 3 in. wide to the hem. This is suspended in a "frame" made from sash cord with S-hooks at each corner. Rubber bands looped through screw eyes and attached to the S-hooks support the target in position but give readily if struck by the ball.

The center right-hand detail shows how the unit folds for carrying or storage, the dotted lines indicating the position of the parts when opened for use. ★ ★ ★





**ADD NIGHTTIME BEAUTY** to shrubs and garden pool with the individual accent lights in this outdoor lighting kit. Set includes heavy-duty transformer which changes 110-v. house current to harmless 12-v. current. Lights are equipped with translucent plastic shades and planter stakes, can be located anywhere along the 75-ft. length of waterproof cable which comes with the kit. Five-light kit (pictured below) sells for \$29.95, 10-light kit for \$34.95. Available in most stores or from Plantalite Co., 3694 Kettner Blvd., San Diego 1, Calif.

**LILY-PAD LIGHTS** for your garden pool provide dramatic lighting effect floating on the surface of the pool amid real water lilies. Artificial pads are clipped over light bulbs in watertight sockets and connected by a waterproof cord to a weatherproof outlet beside the pool. Especially effective when the pool is ornamented with statuary and framed with shrubbery or towering trees which can be emphasized with accent lights to balance the landscaping effect. Manufactured by Westinghouse



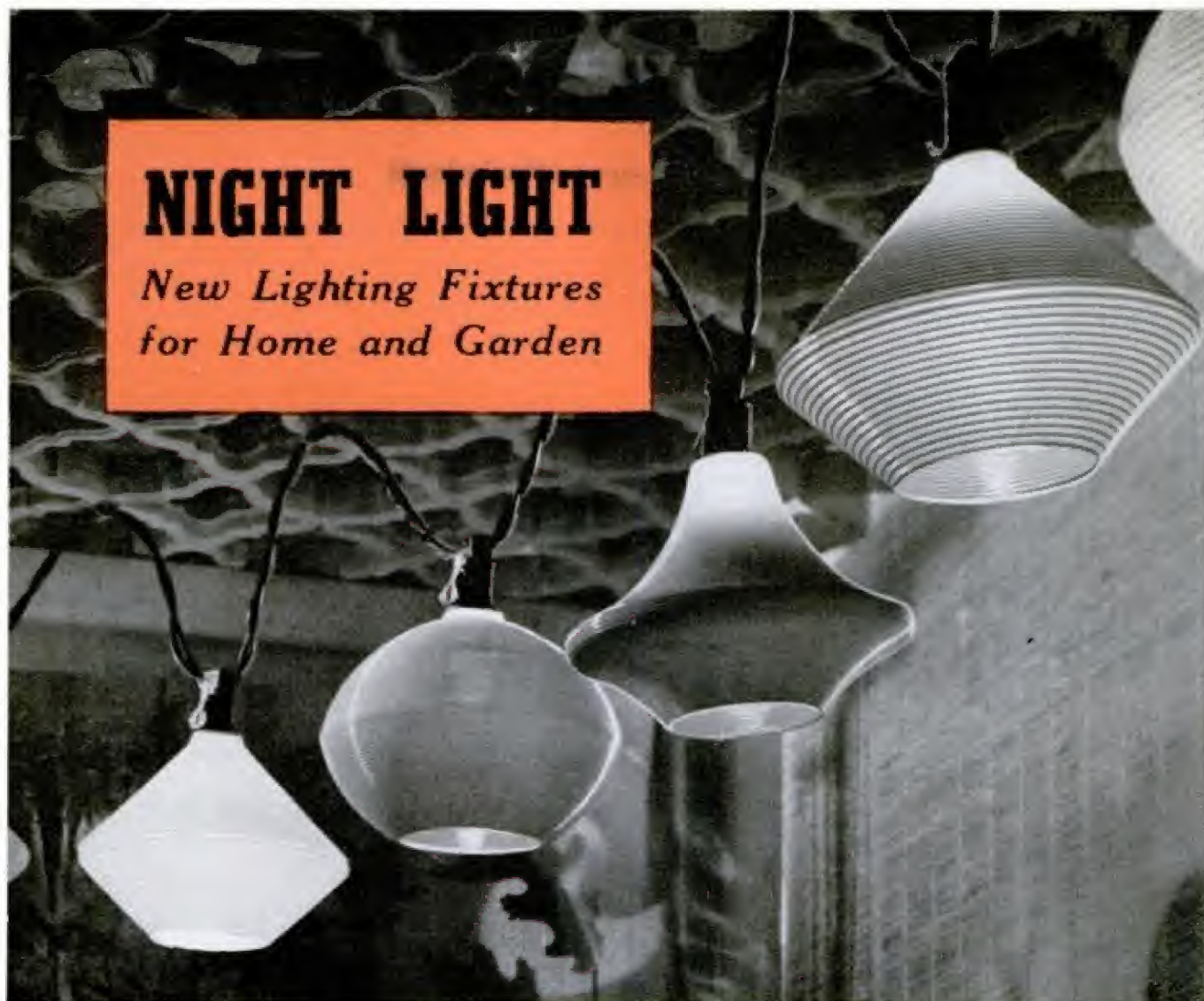
**SOFT GLOW** from electro-luminescent panels lights walk for guests, and can burn day and night for a whole year at a cost of only one cent. The glass panel has an electrically conductive film and is coated with a special phosphor so that it glows when electricity is applied. Weatherproof unit utilizes a  $1\frac{1}{8} \times 2\frac{3}{4} \times 4\frac{1}{2}$ -in. aluminum die-cast box, comes complete with hermetically sealed Rayescent light panel, stainless steel cover and rubber gasket. Solar Sonic Devices, Inc., Hicksville, L. I., N. Y.





# NIGHT LIGHT

*New Lighting Fixtures  
for Home and Garden*



**PATIO AND PARTY LAMPS** come in a variety of shapes and colors. Shades are tough, weather-resistant plastic. May be used indoors during the winter to brighten up a recreation or family room, then taken outdoors in the spring to light the patio for those special occasions. Suspend them from hooks in the ceiling, garden posts, tree branches, etc. Shades retain color year after year. Noma Lites, Inc., 55 W. 13th St., New York City

**ELECTRON STEP LITES**, utilizing Westinghouse Rayescent panels, permit person to use stairs in dimly lighted halls with sureness and safety, below and left. Surface mounted, thin flat 4 x 4-in. lamps plug into recessed receptacles in stair risers. Easily installed in any regular gem box with adapter plate. Wiring is fully concealed behind stairs. Operates on 115-v. a.c. Mfd. by Kliegl Bros. 321 W. 50th St., N. Y.

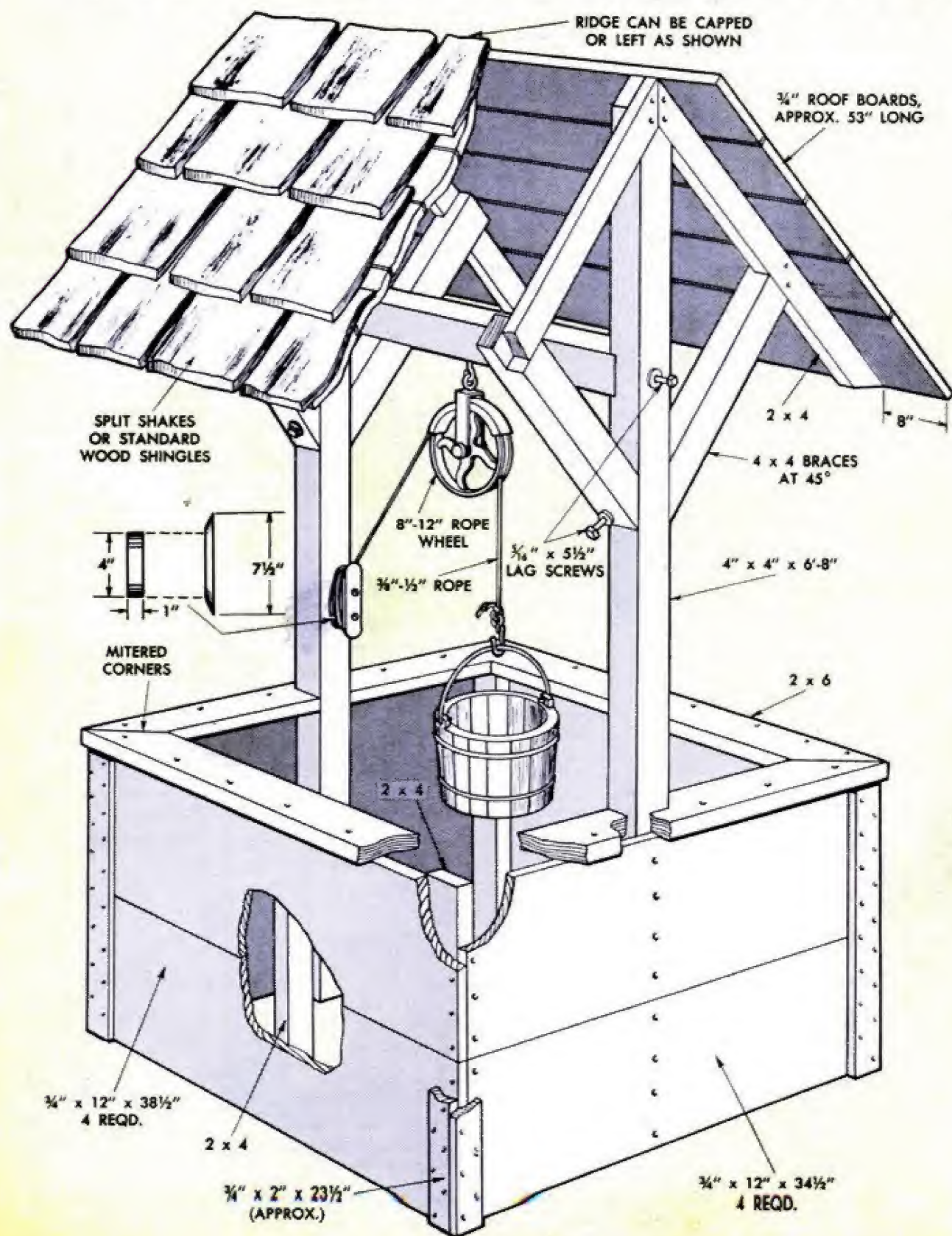




# DON'T JUST WISH FOR YOUR

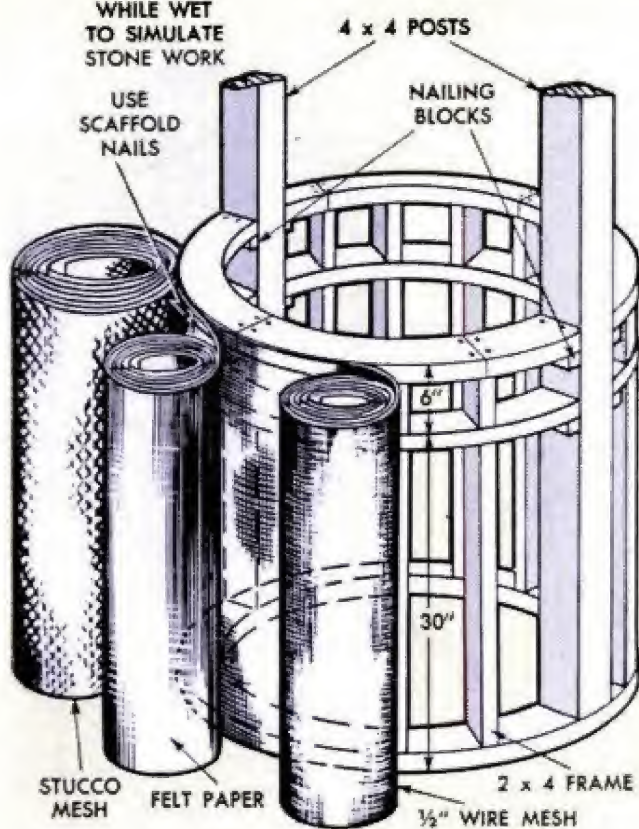
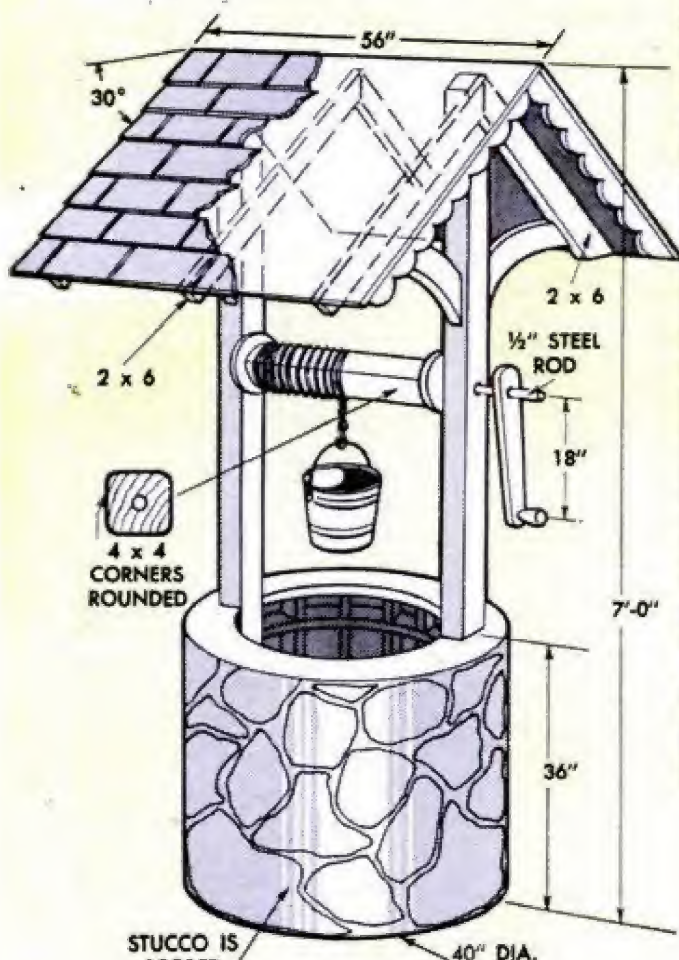
# DON'T JUST WISH FOR YOUR

**Build it yourself and make a wish come true. Here are two designs for your choosing, each quaintly reminiscent of the Early American homestead with its open well and oaken bucket**





## WISHING WELL



**By Donald W. Lewis**

**E**ITHER ONE is easy to build because it's made from stock materials. If you wish, use your own design and material to harmonize with the surroundings. The all-wood rectangular well is built low enough to serve as a bench. Start with the four inside corner posts and nail the side boards to form the box shape. Add the canopy posts with a spacer between them about 15 in. from the top, then add the braces and roof. If you want to use your wishing well as a planter, put in a false bottom about 6 in. from the top. This should have several coats of asphalt before filling with soil. A nail keg cut down to pail size can serve as a rustic bucket.

The round stone well is made with two coats of stucco troweled over a wire mesh. After this dries the simulated stones are painted various colors with masonry paint. Since the bucket is not to be lowered, the windlass can be made immovable. Curving lines in the upper structure will add to that old-fashioned touch which will give many folks a touch of nostalgia. This well, too, can be fitted with a false bottom between the two upper 1 x 4 spacer rings. ★ ★ ★

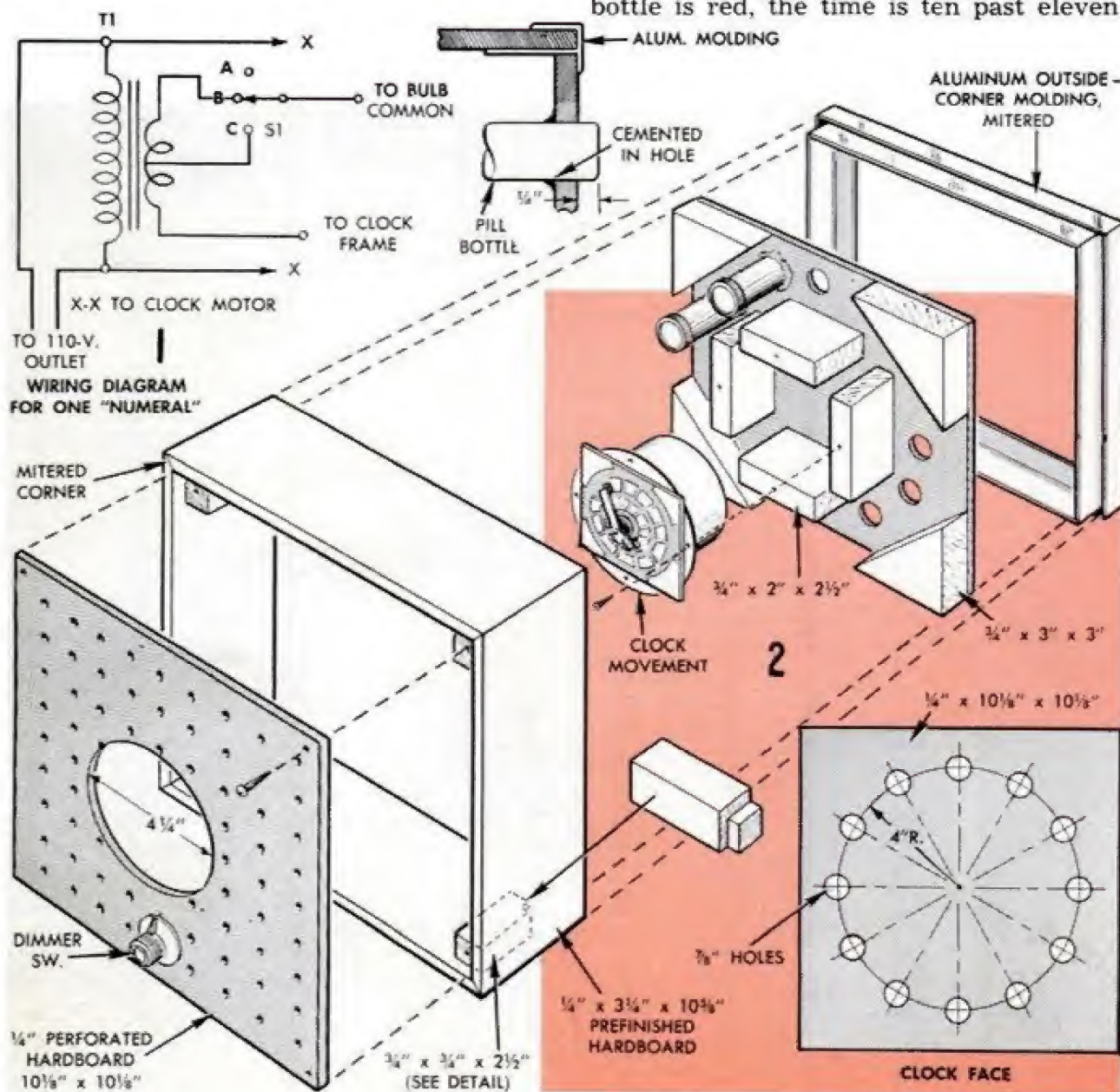




# MINUTES IN COLOR

By Byron G. Wells

THE NOVEL electric clock that you see here is obviously missing an important adjunct to any clock—the hands. But this clock does not have hands. It tells time by actually lighting up the faces of the small glass pill bottles which serve as numerals. In the original model, I used green for minutes and red for hours. By coloring the bulbs with lacquer, and placing two bulbs in each bottle (one red bulb, one green bulb), only twelve bottles are needed and the bottom of each bottle lights either red or green, to indicate the correct time. If, for example, the number two bottle is lit green and the number eleven bottle is red, the time is ten past eleven.

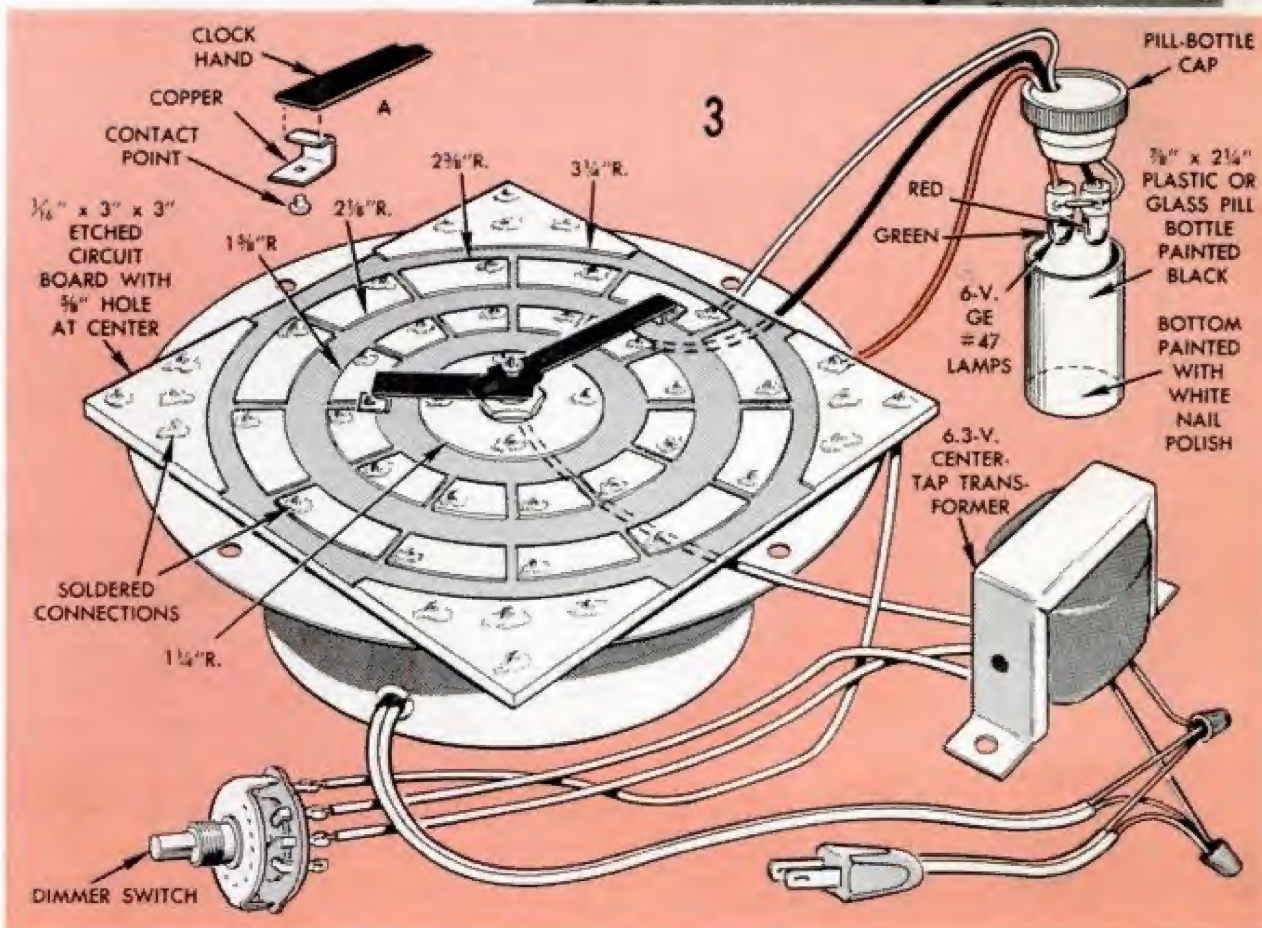
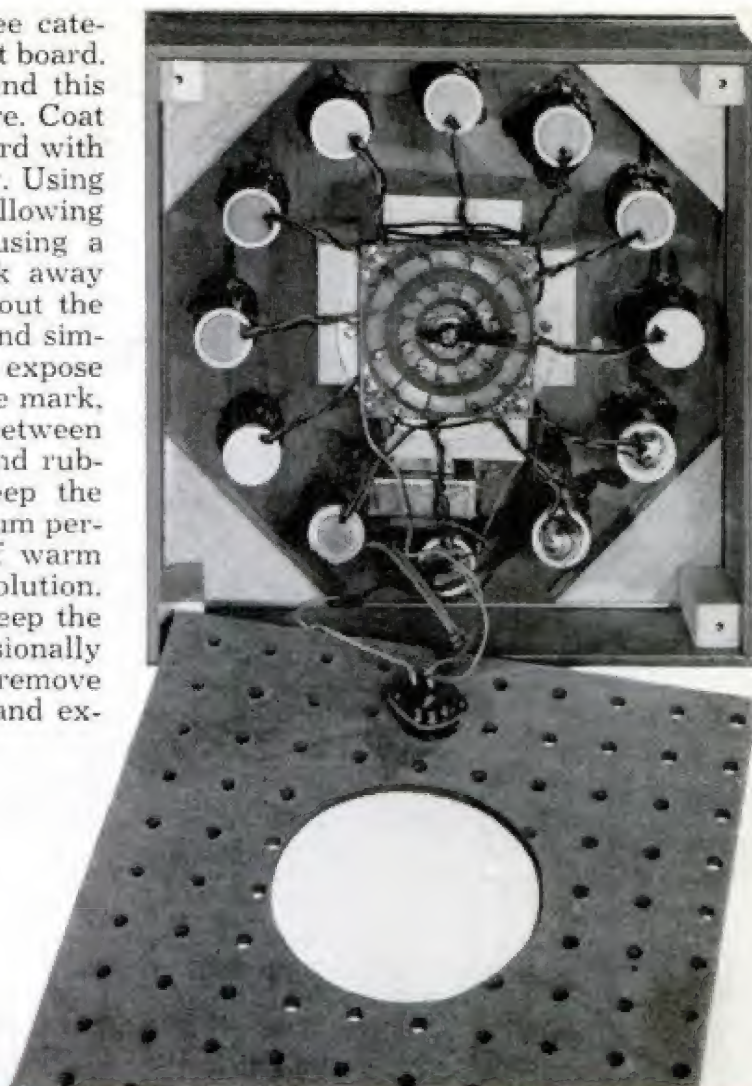




Making this clock falls into three categories. Begin with the printed circuit board. The standard size is 3 x 4½ in., and this must be out to measure 3 in. square. Coat the entire copper surface of the board with acid-resistant ink, and allow to dry. Using dividers, mark off the six circles, following the radii given for each. Now, using a razor blade, carefully trim the ink away from the areas to be etched. Lay out the segments along the copper strips, and simply make a scribe mark in the ink to expose the copper. The narrower the scribe mark, the less "off" time you will have between light changes. Use a plastic bowl and rubber gloves when etching, and keep the room well ventilated. Mix ammonium persulphate, 4 tablespoons in 1 pt. of warm water, and drop the board into the solution. Add the chemical as required to keep the action going. A little agitation occasionally will also help. You can periodically remove the board with nonmetallic tongs and ex-

(Continued to page 184)

**THE IMPORTANT THING** in wiring the circuit board is that extra care must be taken in soldering the connections. Improper soldering will result in erratic illumination. It is important, too, to leave the p-c board in the etchant until all of the copper is removed from the areas. Use rubber gloves while etching







## JUST FOR FUN

### Water Mortar

Lots of splash and nobody gets hurt—that's this water slingshot. You make it just like the regular rubber-band sling, Y-fork, rubber bands and all, except that you substitute one half of a small, hollow rubber ball for the pebble pouch. Of course, only a high-trajectory shot is possible due to the water otherwise spilling from the pouch, but if your aim is right, the victim gets the whole works and at a rather astonishingly long range, too.—Ken Murray

Before Junior's party breaks up pass out toy balloons of the same size but different colors. Have each contestant inflate his balloon but not tie it, then line them up at the end of the room. Give a signal to release the balloons. The balloon that first "jets" to the opposite end of the room is the winner.



### Teeter-Hills

When small fry begin to get out of hand on a rainy day, demonstrate this teeter board, using a powered toy tank or cat tractor. One demonstration should be enough to spark lively imaginations and keep 'em busy for hours dreaming up new playroom strategy. The board is simple to make. Cut a piece of  $\frac{3}{8}$ -in. plywood about 10 in. wide and 20 or 24 in. long and tack a 1 x 3 block at the center. Bevel the lower edge at one end so that the toy cat will climb onto the ramp easily. Several boards of different lengths and heights can make things more interesting.—T. J. Gray

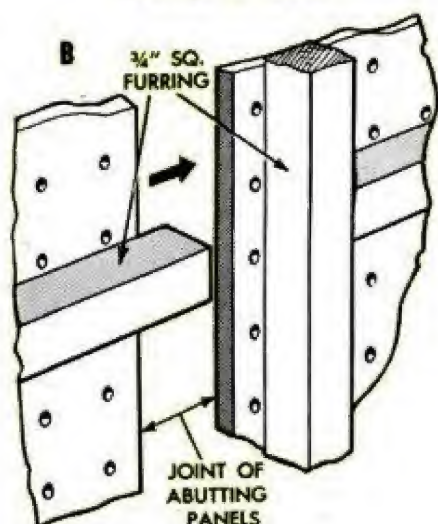
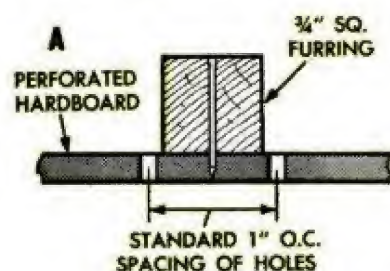


### 'Chuting Toy Paratroopers

Toy-size paratroopers 'chuted into enemy territory can be the winning strategy on vacant-lot battlegrounds. Of course, everything should be kept top secret and the wind must be right, but usually there's a chance to maneuver for position. The 'chutes are made by cutting 12-sided figures, about 12 in. across the flats, from very light plastic. Punch a small hole near each corner through which the shroud lines (20-in. lengths of thread) are tied. Then, before you bring the shrouds together, stretch the plastic 'chute over a softball to form an air pocket. Lash the shrouds together at a point about half their length. Then braid from there on to the ends and tie on the paratrooper. When ready to make the surprise drop, bring the 'chute together, being careful not to foul the lines, and toss 'chute and trooper high in the air. The 'chute will open readily and carry the trooper to enemy territory.—Arne O. Vidstrand



# Now, No Holes Barred in New Hardboard Application



MORE TIMES than not you'd like to hang something at a certain spot on a wall faced with perforated hardboard only to find you can't—the holes are blocked by a furring strip or stud. Now, thanks to a method of application worked out by the Georgia-Pacific Corp., you can apply perforated hardboard either directly to the studs or a covered wall and make use of every single hole. The secret is in using  $\frac{3}{4}$ -in.-sq. furring strips and placing them between the rows of holes as shown in detail A.

But how is this possible? You tack or cement the furring strips to the perforated board first, sufficient to hold them until the panel can be placed against the wall and nailed in the normal manner from the face side. With the panel flat on the floor, face side down, you first nail a  $\frac{3}{4}$ -in.-sq. strip along the 8-ft. edge just inside the first row of holes so that the panel will lap the furring behind the adjacent panel as in detail B. Additional strips (7 of them) are now placed crosswise of the panel from top to bottom. Cut them  $\frac{3}{4}$  in. shorter than the width of the panel and place them between the rows of holes. ★ ★ ★



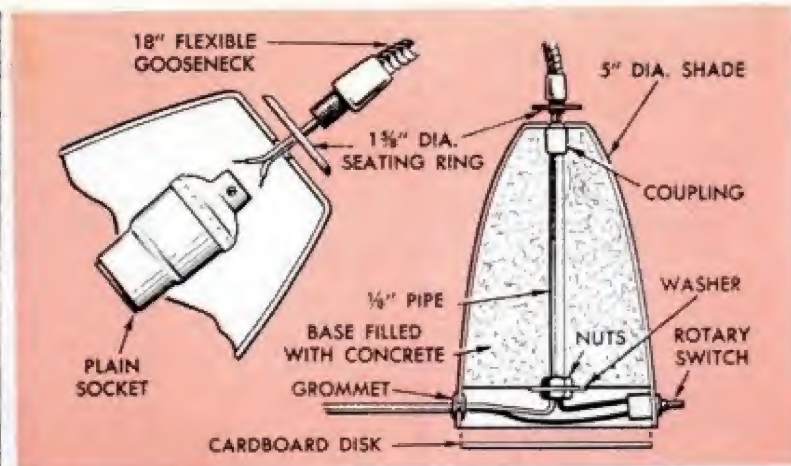
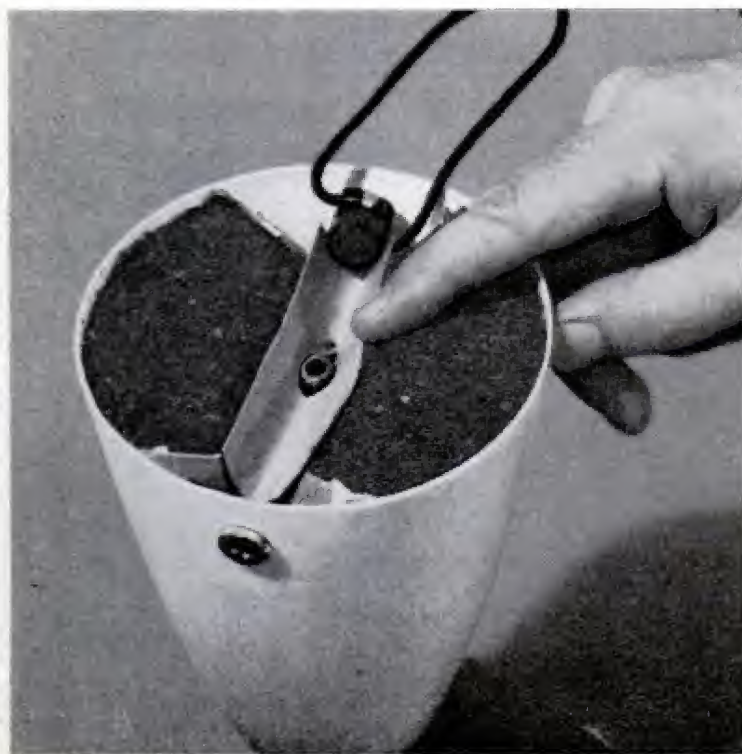
EITHER contact cement or nails can be used to hold the furring in position on the back of the panel. Use nails no longer than  $\frac{7}{8}$  in. so as not to go through panel (inset photo), then nail from face side through furring and into stud







USE CARDBOARD and tape for recess forms around switch and bushing. Curved strip set in moist concrete forms cord channel



## SPOTLIGHT ON LAMPS

TWO SHADES are better than one, particularly in the case of these modern gooseneck table lamps, for one of the shades forms the base. Each lamp is assembled from standard lamp fittings, fiber-glas bullet shades, a regular flexible brass arm and, of all things! concrete.

As you see in the detail, the concrete is used to weight the base and keep it from tipping. It will take about 11 lb. of concrete, the kind you buy dry-mixed in a paper bag. The details show quite clearly how you assemble the parts to make a single lamp. Be especially careful when drilling the holes through the shade that serves as the base not to crack or otherwise damage the material. Install switch, bushing, grommet, pipe and coupling in the shade as detailed. Now notice in the lower photo that the switch and bushing are protected by pieces of light cardboard when pouring the concrete and that after pouring, a groove, or channel, is formed for the cord with a strip of cardboard or sheet metal. This done, allow the concrete to harden (keep it damp for several hours after it sets) and then assemble the wiring and the shade, using a plain, or keyless, socket as detailed. Finally, fit a disk of cardboard into the bottom of the base shade, glue in place and cover with felt so the base will not scratch table tops.

—Ron Anderson

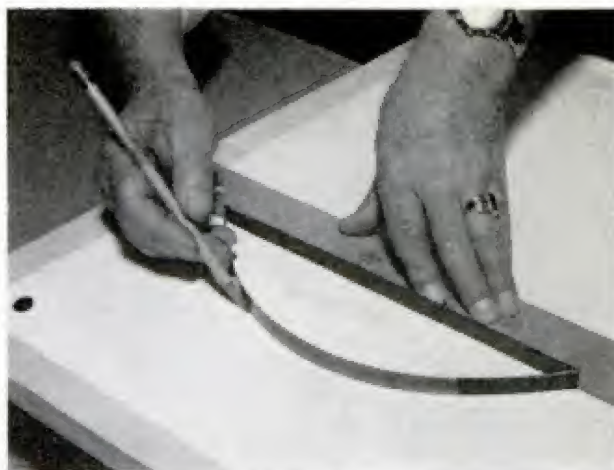


## SHOP SHORT CUTS

### Any Curve in a Pinch

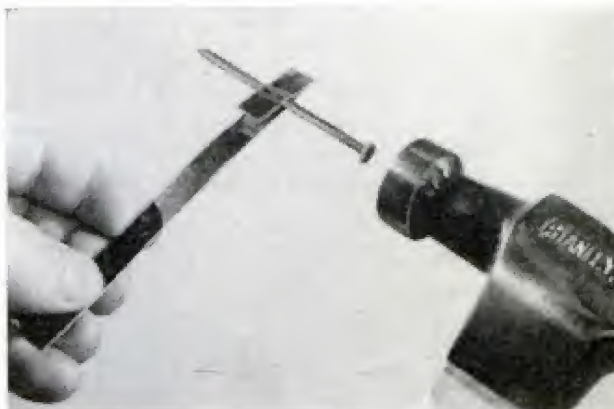
One quick way of striking a true arc when there's no compass or trammel handy is to make use of a hacksaw blade and a length of adhesive tape or masking tape. The former is best as the latter tends to stretch. Bend the blade to the required radius, stretch the tape and stick the ends to the blade as pictured. You can adjust the blade to an infinite number of radii within the limits of its bendability.

—G. E. Hendrickson



### Finger Saver

When you have to start a nail in a place difficult to reach you can make the job much easier and also save your fingers by bending a holder from a strip of thin sheet metal. The holder can be any convenient length. Just bend about 1 in. of the metal back on itself and crimp it over the nail as pictured. It will hold the nail straight in line until you get it started. A similar holder, bent at an angle, can also be used to start a screw.—Ken Murray



### Bottoms Up

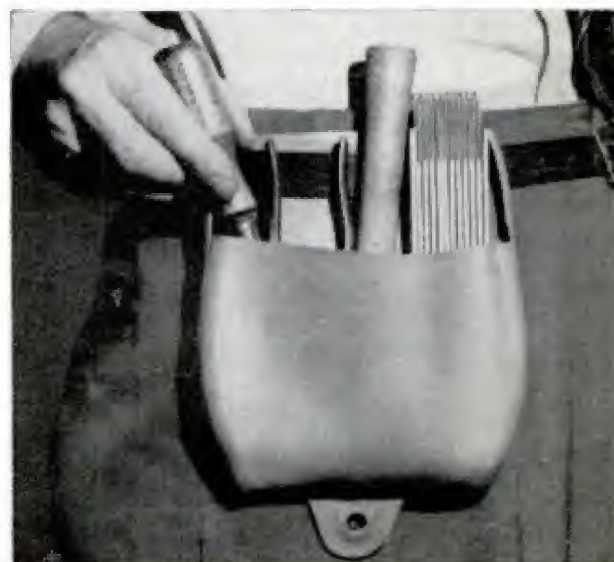
When you make a sanding block make it T-shaped from two pieces of  $\frac{3}{4}$ -in. stock. The narrower block serves as the handle, the other as the pad. The advantage of such a block is that you can turn it upside down and lock the handle in the vise as shown. In this position the block is just the thing for sanding very small pieces which cannot be sanded effectively by any other hand method. By facing the block with very fine abrasive cloth you also can do quite accurate lapping of small metal parts or sharpen edge tools.



### Tool Holster

Half of a hot-water bottle, discarded because of a break or other damage, makes a good belt holster, or caddy, for tools. Cut across one side of the bottle at the halfway point, then cut up the edges about  $2\frac{1}{2}$  in., and finally cut through the opposite side parallel with the first cut. This forms a flap which is slit at two points so that your belt can be passed through.—William Swallow

An old screwdriver can be used to make an Allen wrench handier for getting into tight places. Just saw the blade off the shank, square the end and weld, or braze on a 1-in. length cut from an Allen wrench. File the weld or braze smooth.







ON THE HOIST, PM-38 displays the planing hull lines which make possible high speeds with small motor



CALKING COMPOUND is used to seal all the lower planking joints at stem, keelson, chines and transom

IF YOU WISH, cut the deck planking first and then install the seat before you begin planking the deck



# PM-38

*38-m.p.h. performance*

*\$38 for materials*

*38 hours to build*

**By Arthur M. Mikesell**

(PM Crafts Boating Editor)

**E**ASY ON THE EYES as well as the pocketbook, the PM-38 outperforms boats costing hundreds of dollars more and runs like a racer's dream with just 28 horses clamped to the transom. This streamlined 13-ft., 9-in. runabout can be described in just four words — maximum return, minimum expense.

What's the secret? Since everyone knows that weight is one of the most important performance factors, our designer laid out plans for a fast planing hull and then hacked off weight wherever possible. The result is an agile 200-lb. boat designed for use with a relatively small motor. However, strength and safety were not sacrificed for speed. In addition to the two full frames and transom, two "half frames" were added to provide extra rigidity. Where necessary, joints were reinforced with strong but light gussets.

For economy, all parts of the hull fit into cutting diagrams which leave almost no waste. This makes accurate cutting very important, so we suggest that you use full-size paper patterns wherever possible. Incidentally, you can make a perfect tracing wheel for transferring these patterns to the wood by salvaging a gear from a discarded alarm clock and mounting it between the legs of a wooden clothespin with a nail.

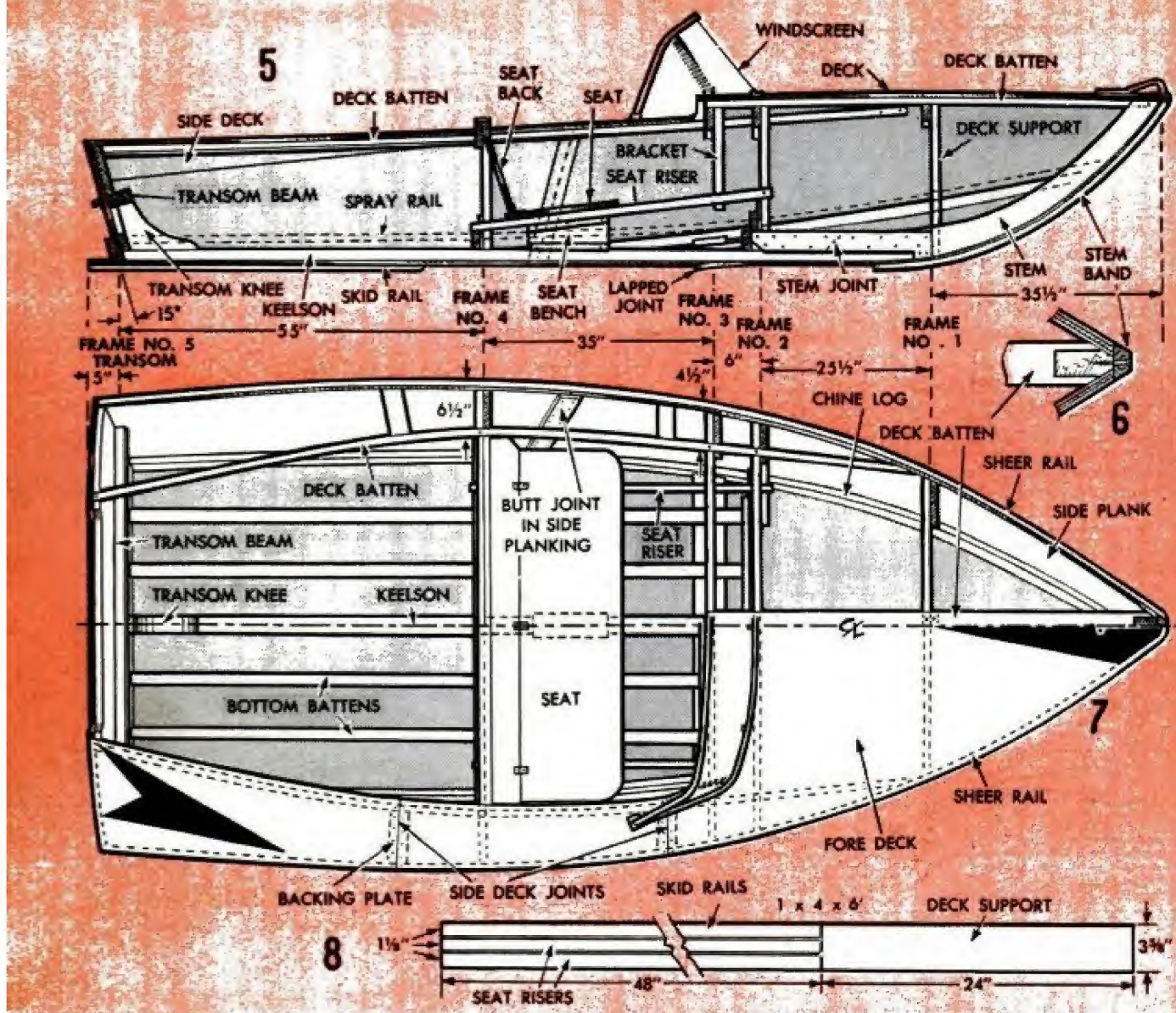
Even the construction is streamlined. You won't need any complex building forms to build the PM-38. Two simple A-frames made from scrap lumber are used to support the framing during construction, Fig. 10. While this means that a certain amount of extra care is necessary to make sure that all parts of the frame remain in proper alignment, it cuts down building time.

Cut the transom back from ½-in. plywood, Figs. 9 and 11, and use this piece as a template to saw the 1 x 4 framing members and the 1 x 8 face plate to fit. Before mounting, notch the bottom framing member for the bottom battens and the face plate for the deck battens. The transom cross beam will be approximately 61 in. long. After cutting this from the 16-ft. length of 2 x 4, saw the remainder length-



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wise to form the keelson and two outer deck battens, Fig. 12.

Assemble the frame on the plywood back, using waterproof glue (Weldwood, or similar) and 1 1/4-in. ring-groove nails. For additional resistance to corrosion, you might consider substituting serrated bronze nails (Stronghold, Anchorfast, etc.), though they are somewhat more expensive. (This also holds true for all screws used in the boat.) Fasten the 2 x 4 cross beam from the outside with 1 3/4-in. No. 8 flatheaded screws, countersinking them slightly so that they can be masked with wood putty.

Frames 1 and 3 aren't actually complete frames since each consists of just a beam and two brackets, Fig. 9. These will be installed later, once the side planking has been completed. Frames 2 and 4 utilize 1/4-in. plywood gussets between the side and bottom members to gain additional strength. Coat all contacting surfaces at each joint with glue and secure with two 1 3/4-in. No. 8 screws per joint.

Note that the bottom of frame 2 is made in two pieces which are linked by a third. Glue and screw the chine joints first, then fasten the third member between them with six 1 3/4-in. No. 8 screws and glue. After the glue has hardened, notch this third piece to receive the keelson.

Cut the two-piece stem from a 5-ft. length of 2 x 10, Fig. 2. Assemble the two parts temporarily to make sure that you have a tight even joint and trim if necessary, then nail the two pieces together with two 2-in. nails, one through the top and the other through the bottom. To further strengthen this joint, fasten 1/4-in. plywood gussets to each side with glue and 1 1/4-in. nails, Figs. 1, 5 and 10.

Lay the stem aside until the glue has hardened (about 24 hrs.). The outer edges must be beveled according to sections A and B, Fig. 2. Don't continue the bevel below B, since this will be done later when you attach the keelson, at which time the bevels will be faired into the keelson.

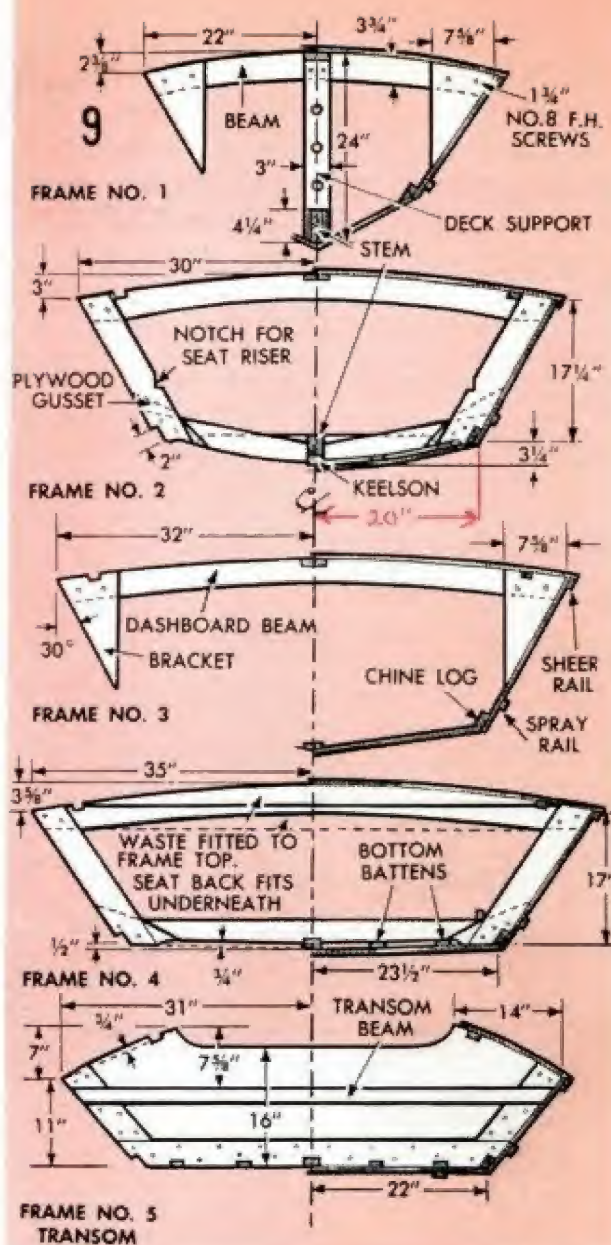


Attach the fore end of the keelson to the notched portion of the stem with three 2½-in. No. 10 screws and glue. Notch the transom to accept the aft end, but before attaching the keelson, cut the transom knee from the 2 x 10 from which you obtained the stem, Fig. 2, 3 and 5. This piece must be notched for the 1 x 4 bottom frame member in order to fit flat against the plywood transom back under the beam.

Temporarily assemble the transom knee, transom and keelson to make sure that all mating surfaces fit tightly together and trim if necessary. Then coat all contacting surfaces of knee, beam and transom back with glue, and fasten the knee in position using two 1¾-in. No. 8 screws through the plywood and one 2½-in. No. 10 screw down through the beam into the knee. Counter-sink exterior fastenings. Finally, fit the keelson into the transom notch and secure it to the transom knee with glue and two 2½-in. No. 10 screws.

Turn the stem-keelson-transom unit upside down on the floor and measure off the locations for frames 2 and 4, Fig. 5. After marking these locations on the keelson, assemble the A-frames which provide rigid support for the hull during the remainder of construction. The bottom of frame 4 must be notched to accept the keelson. Erect the hull framing, using the A-frames and temporary supports at the stem and transom. The 1 x 4 deck support, Fig. 8, should be notched, drilled (to lighten it) and installed at this time. The keelson must be perfectly flat. As the work of framing and planking progresses, check periodi-

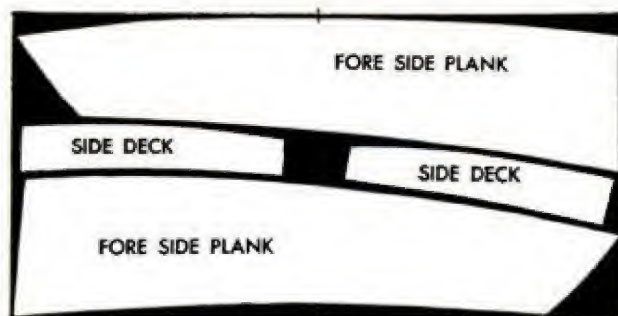
**TRAILERING** the PM-38 is a breeze. The light 200-lb. hull is exceptionally easy to launch and retrieve



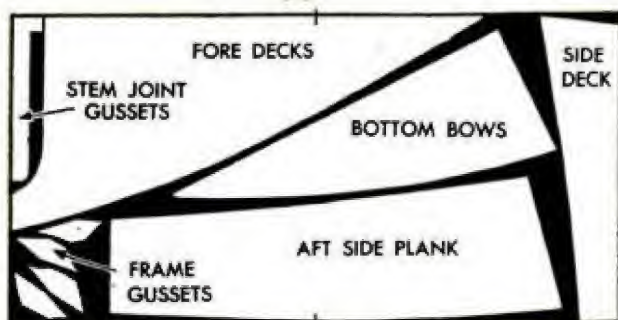




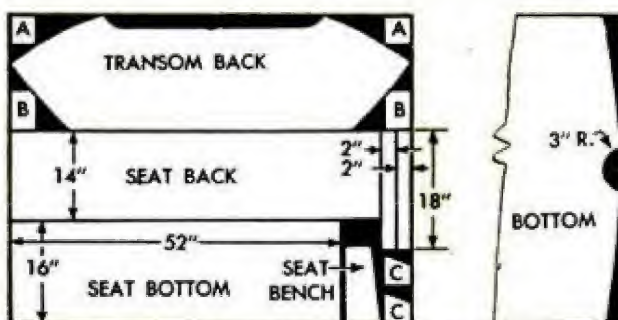




ONE 4' x 8' SHEET— $\frac{1}{4}$ " FIR PLYWOOD, EXT. AC



TWO 4' x 8' SHEETS— $\frac{1}{4}$ " FIR PLYWOOD, EXT. AC



ONE 48" x 62" SHEET— $\frac{1}{4}$ " FIR PLYWOOD, EXT. AC

ONE 4' x 8' SHEET— $\frac{3}{8}$ " FIR PLYWOOD, EXT. AC

in place with twelve  $1\frac{3}{4}$ -in. No. 8 screws.

Clamp the  $\frac{3}{8}$ -in. plywood panel on the frame so it projects 3 in. beyond the 1 x 4 outside bottom framing of the transom. After marking the chine outline on the panel, remove it and cut to shape, sawing along the outside of the line to allow for final fitting after securing it to the frame. Also, saw a center slit 30 in. long in the fore end of the panel to accommodate the curve of the hull at this point. After sawing the panel, clamp it over the framing again to check the fit, then crawl under the frame and mark the location of chines, keelson, battens, etc. Remove the panel and drill lead holes at 12-in. intervals along the centerline of the outline of each member. Then turn the panel over and countersink each hole slightly. Be sure to replace the panel in exactly the same location so that screws and nails will be positioned in the center of each frame member.

(Text continues)

## MATERIALS LIST

**NOTE**—Since materials costs vary in different areas of the country (and even within the same state), we can't guarantee that the PM-38 won't cost you more than \$38 to build. For instance, a spot check of urban lumber dealers showed that prices ran as much as 50% higher than those in the small town where the pilot model was built, since delivery charges were automatically included.

### LUMBER (All fir except stem band)

- 1 pc.—1 x 4 x 14'—Chines
- 2 pcs.—1 x 4 x 8'—Bottom battens
- 1 pc.—1 x 4 x 14'—Sheer and spray rails
- 1 pc.—1 x 4 x 6'—Center deck batten
- 1 pc.—1 x 4 x 10'—Transom framing
- 1 pc.—1 x 4 x 10'—Frame No. 2
- 1 pc.—1 x 4 x 8'—Frame No. 4
- 1 pc.—1 x 4 x 6'—Skid rails, seat risers and Frame No. 1 deck support
- 2 pcs.—1 x 6 x 10'—Deck beams
- 1 pc.—1 x 8 x 8'—Transom face plate and brackets
- 1 pc.—2 x 4 x 16'—Keelson, transom beam and outer deck battens
- 1 pc.—2 x 10 x 5'—Stem and transom knee
- 1 pc.— $\frac{1}{2}$ " x  $1\frac{1}{8}$ " x 4'—Stem band (oak or other hard wood)

### PLYWOOD (Fir, exterior grade AC)

- 1 pc.— $\frac{1}{2}$ " x 48" x 62"—Transom, seat and seat back
- 1 pc.— $\frac{3}{8}$ " x 4' x 8'—Bottom planking
- 8 pcs.— $\frac{1}{4}$ " x 4' x 8'—Planking for sides, deck and bottom

### FASTENINGS AND MISC.

- 1 gross—1" No. 8 flatheaded screws, cadmium plated
- 1 lb.— $1\frac{1}{4}$ " ring-groove nails (Sears)
- 1 doz.—2 $\frac{1}{2}$ " No. 10 flatheaded screws, cadmium plated
- 9 doz.— $1\frac{3}{4}$ " No. 8 flatheaded screws, cadmium plated
- 3 pcs.— $1\frac{1}{2}$ " x  $1\frac{1}{2}$ " angle irons
- 1 lb.—Waterproof glue (Weldwood or similar)
- 1 pt.—Calking compound
- $\frac{1}{2}$  pt.—Wood putty
- 1 gal.—Exterior semigloss paint

### MOTOR AND PROPS

On test runs, the PM-38 hit approximately 35 m.p.h. when powered by a 28-hp. Johnson (standard three-blade wheel) and carrying one 155-lb. person. To reach 38 m.p.h., the standard wheel was replaced with a two-blade racing prop (Michigan Wheel AJC462 10 x 14). This is a bronze wheel and should be used only in fresh water. For salt water operation, use the AJC464 10 x 14 two-blade aluminum wheel. According to OBC ratings, the maximum size motor to be used on the PM-38 is 45-hp.

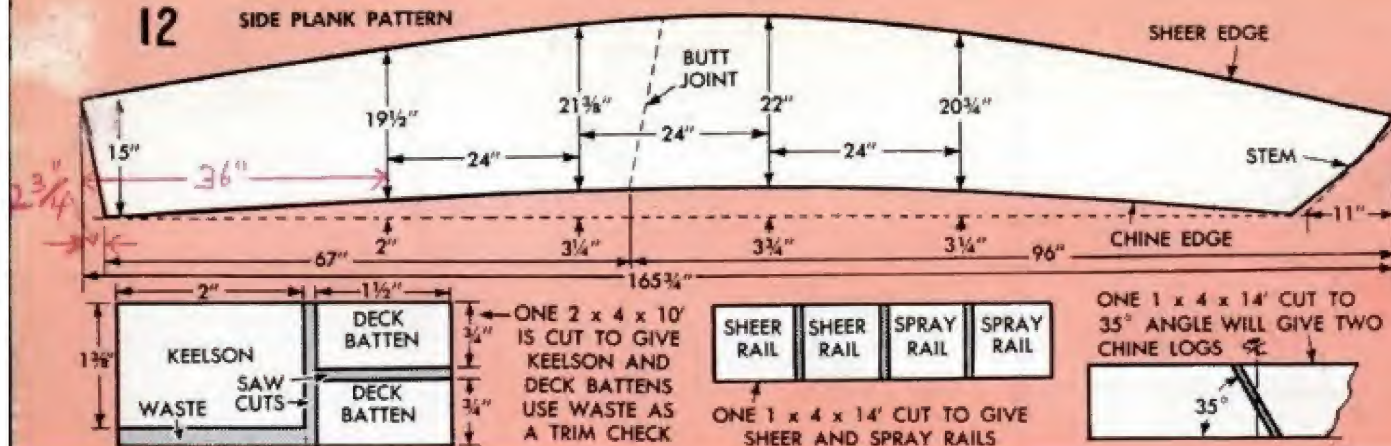
### LARGE-SIZE PLANS AVAILABLE

If you prefer to work from larger drawings than those included here, a set of plans on 22" x 30" sheets is available. For the plans, plus a booklet containing the text and photos, send \$3.00 to Popular Mechanics Blueprint Dept., 200 E. Ontario St., Chicago 11, Ill.

**REMOTE CONTROLS** should be mounted on a piece of  $\frac{1}{4}$ -in. plywood that is attached to batten and chine log







Before attaching the bottom planking, coat both the bottom of the transom and the mating surface of the plywood planking with calking compound. Then apply glue to the bottom surfaces of the frame members and the matching areas of the plywood planking. Finally, fasten the planking in place, using a double row of 1 1/4-in. nails spaced 2 in. apart at the transom and 1-in. No. 8 screws spaced 4 in. apart along the battens, chines and keelson. Use a double row of screws along the slit in the fore part of the planking.

The rest of the bottom planking is 1/4-in. plywood and will require steaming or soaking to bend to the hull curves. To facilitate bending, place a wet towel on the exterior surface and run a hot iron over it. Coat contacting surfaces with glue and fasten

with 1 1/4-in. nails along the stem and 1-in. No. 8 screws at the chines.

Note that the 1/4-in. fore planking overlaps the 3/8-in. rear planking approximately at frame 3, Fig. 1. Cut backing blocks to reinforce this joint from 1/2-in. plywood and glue them in place inside the hull. Screws should go through both pieces of planking and into these blocks. Space all fore planking fastenings about 2 in. apart.

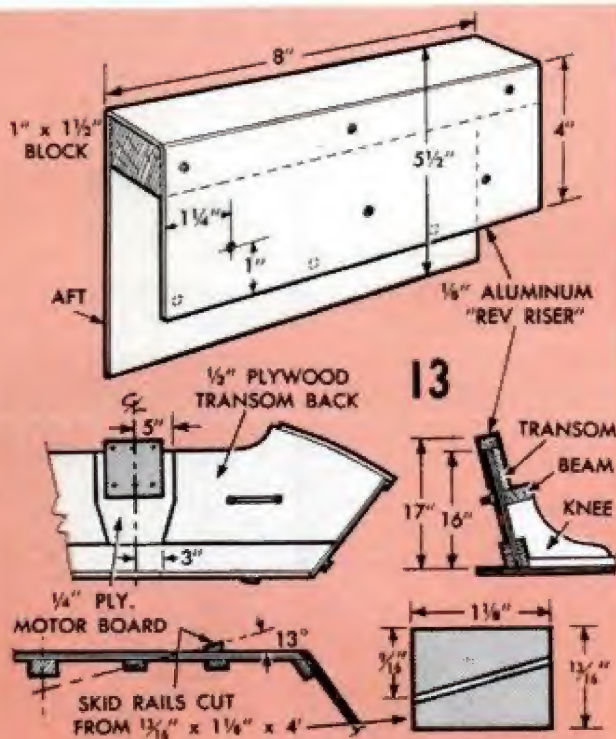
Use the same procedure when planking the sides as you did when installing the bottom planking. Calk the joints between side planking, chine and transom, but coat all other mating surfaces with glue. Attach the planking with 1 1/4-in. nails spaced 2 in. apart. Use glue and 1 1/4-in. nails to secure the 1/2-in. plywood backing plate for the butt joint. Drive these nails from the outside through the planking and backing plate. Since they are slightly long for this joint, you'll have to clinch the ends which protrude through the backing plate.

Before turning the hull right side up, cut and install the skid rails, Figs. 8 and 13. Taper and round the fore end of each rail to reduce drag. Use calking compound when mounting the rails, and secure them to the hull with 1-in. No. 8 screws through the planking and into the outer bottom battens. Countersink these screws slightly and fill the holes with wood putty.

To complete the bottom, plane the stem planking joint flat and install the stem band, Figs. 5 and 6, using calking compound and 1-in. No. 8 screws spaced 6 in. apart. Soaking the stem band in hot water for a short time will make bending easier.

Now turn the hull over and rest it on padded saw horses. Cut the two sheer rails and spray rails from a 1 x 4, Fig. 12. The sheer rails should be mounted first, starting at the bow. Coat all contacting surfaces with glue and fasten the rails from inside the hull with 1-in. No. 8 screws at 8-in. intervals. Following the same procedure, secure the spray rails 3 in. above chines.

(Continued to page 198)





# FOR SHUTTERBUGS

**1. ANYONE CAN NOW** add a sound track to 8-mm. movie film—color or black and white—for less than one-half cent per foot. The sound striper is a compact unit weighing less than six pounds. Iron-oxide solution is applied through a pinhole opening in the disposable plastic cartridge, and stripes 200 feet in less than 10 minutes. In a self-contained carrying case, unit is priced at \$59.95. Mansfield Industries Inc., 1227 W. Loyola Ave., Chicago 26, Ill.

**2. FLIP-OVER FILM CHAMBER** on dual-run 8-mm. movie camera introduces a unique body design. Camera permits exposing 50 feet of 8-mm. movie film without opening body and rethreading roll after first 25-foot run. Film chamber pivots around lens, allowing first one side and then other to be exposed. Pivoting action takes only two seconds. The camera includes zoom lens and automatic exposure meter. Priced at \$189.95. Sekonic Inc., 130 W. 42 St., New York 36, N. Y.

**3. BUILT-IN, POP-UP FLASH UNIT** eliminates use of attached flash holder. So compact is flash unit that it doesn't add to over-all size of camera. Using thrifty AG-1 flash bulbs, unit provides uniform, flat lighting. The Motomatic 35F features power drive; one winding is enough for 10 shots. Film winds automatically after each exposure. Another feature is the electric-eye exposure control. Retail at less than \$120. Eastman Kodak Co., Rochester 4, N. Y.

**4. SUN GUN PROFESSIONAL**, using a special 1000-watt lamp, is capable of delivering the same exposure value as a 5000-watt conventional flood having the same beam angle. The high-silica halogen tube is only three inches long and sets in a reflector six inches wide. A dual-purpose flood lens, portrait lens and barn door come with unit. Eight optional accessories also are available. Sylvania Electric Products Inc., 730 Third Ave., New York 17, N. Y.





X 745

# GETTING RID OF



**DRILLING HOLES** in the stump will speed rotting or burning and is necessary when applying chemicals

**TO ROT A STUMP** cut flush with the ground, cover it with a thin layer of soil and water area frequently



**WHEN BURNING** a stump out, check the fire often to make sure that it has adequate ventilation and fuel

**AFTER TREATING** the stump with chemicals, protect it from children and pets with a tight waterproof cover





# TREE STUMPS

By Fred R. James

**G**OT A STUMP you would like to get rid of? The unfortunate death of thousands of American trees through the ravages of disease during the past few years has brought many property owners face-to-face with the problem of stump removal. Not only are the remains of these dead trees dangerous and unsightly, but they can often infect nearby healthy trees.

While the removal of the upper portion of a tree is a relatively simple project, stump extraction is something else again. Digging it out by hand is a laborious job. But there are easier ways—at least easier on your back.

## ROTTING

Probably the easiest and cheapest method of removing a stump is to let it rot in moist soil. If not already done, cut the stump at ground level or slightly below, cover it with soil and keep this soil moist. Decay organisms will rot the wood, and grass can even be planted in this thin layer of soil if you are careful to water it during dry spells. The main shortcoming of this method is that it is extremely slow. However, rotting can be hastened by boring several vertical holes about 6 in. deep in the stump before you bury it.

## BURNING

It's possible to burn a stump out using a fire fed with charcoal, coke or coal. Make a stove to hold the fire by removing the bottom and top from a metal container and punching a few 1-in. draft holes near the bottom. A 5-gal. pail makes a good stove for use with most smaller stumps. Place it either on top of the stump or down over it and build the fire. Use kindling wood to start the fire before adding the charcoal, coke or coal. When the fire burns one part of the stump, move it to a new location. For very large stumps, you can make a stove from a 55-gal. drum or an enclosure of bricks.

## CHEMICAL REMOVERS

One of the most promising methods of stump removal is the application of chemicals which filter through the root system and create a condition of maximum combustibility to hasten burning. One efficient chemical is a mixture of 4.5 parts sodium dichromate, 1.5 parts cupric chloride, 1 part lead acetate and 1 part manganese dichloride, which is sold under the trade name, "Stumpfyre."

(Continued to page 186)



USE KINDLING or charcoal to start burning a treated stump. It will burn for from one to three weeks



REFLECTOR SHIELD made of aluminum foil tacked over a light frame will hasten the burning of a stump







## FOR THE FISHERMAN

### Spotlighting Bait

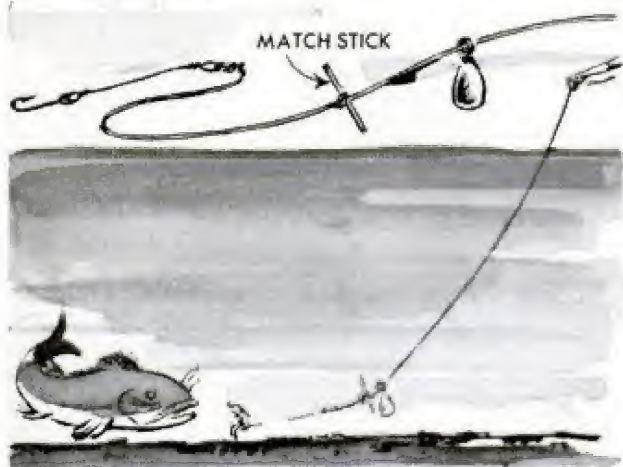
You may have your own method of catching grasshoppers for bait but here's a way that doesn't call for nets or lively footwork, just a stroll along a footpath after dark. You spotlight the hoppers with your flashlight, pick 'em off the grass and weeds at the side of the path and pop 'em into a paper sack or any handy closed container. What could be simpler and easier and more fishermanlike than that?

—G. E. Hendrickson



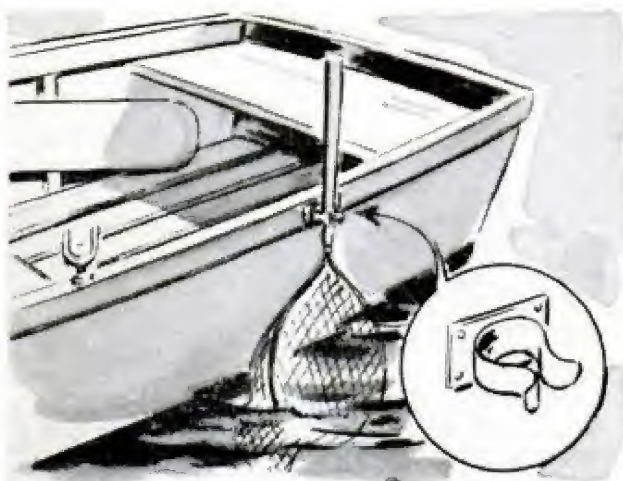
### Lines To Hooks

Threading a line through the eye of a tiny hook can be worse than threading a needle, especially if the wind's tossing the boat or you're in the underbrush along a stream where the light isn't too good. Tying on a leader can sometimes become a similar problem. But carry a needle threader of the type used for threading a sewing needle and you're set to handle any emergencies that develop when you snag hooks on logs or snap a leader—one of those days when everybody else is catching fish and you're repairing tackle, or so it seems.



### Pendant Sinker

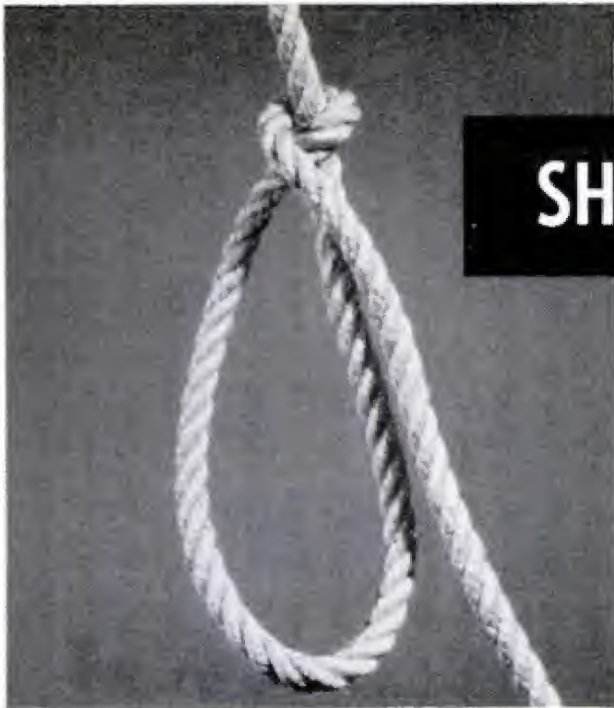
Sly bottom feeders like catfish won't take bait, so says one fisherman, unless it floats free just above the bottom of the stream. Any slight pull on the bait caused by a sinker of the type tied into the line near the bait will cause the wiser old lunkers to drop it after the first nibble. A surer way is to tie a matchstick to the line 8 to 12 in. above the hook and then slide a pendant-type sinker down to the matchstick. In this way the sinker can be dropped to the bottom, permitting the bait to float free.



### Landing-Net Caddy

Boating anything bigger than an over-size crappie may depend much on having the landing net within easy reach at that crucial moment, especially when fishing alone. To make sure that he can reach it handily at any time it's needed and also to prevent the net from becoming entangled with other gear inside the boat, one fisherman screws broom clamps to the gunwales, one each on the port and starboard sides. The clamps can be located anywhere along the length of the boat within convenient reach from seats forward or aft.





## SHORTENING A ROPE

YOU MAY never need to shorten a rope or heavy cord, but you never know; you might be called on to turn the trick—quickly. Study the three photos, one above and two below, and you'll see right away how it's done. First determine about how much the rope is to be shortened, allow a little for take-up when the knot is tightened. Then form a loop and bring the free end around the standing part as in the photo above. Hold firmly with the left hand and begin winding tight coils around the loop as in the lower left-hand photo. Care must be taken to keep the coils uniformly tight and uniformly spaced. In the lower right-hand photo more of the loop is shown, for purposes of clarity, than is permissible. At least one more turn, better, two more turns, of the rope should be made, leaving just enough eye remaining to permit inserting the free end. The knot will untie easily when the line is worked back against the twist of the lay.—*Gordon S. Smith*

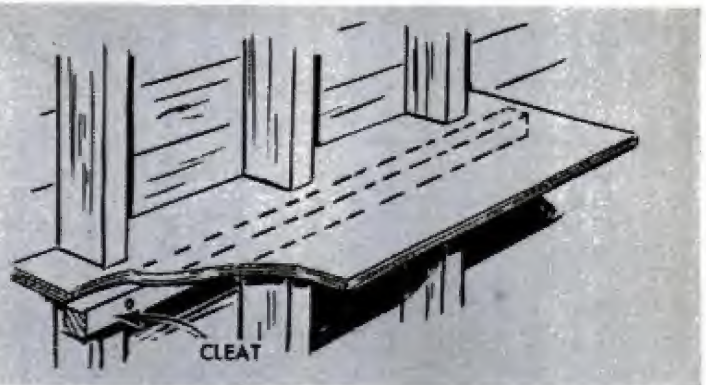




# Solving



**A GOOD IDEA**, if you can get your newsboy to cooperate, is to attach a spring-action screen-door catch to the house for keeping your paper from blowing away

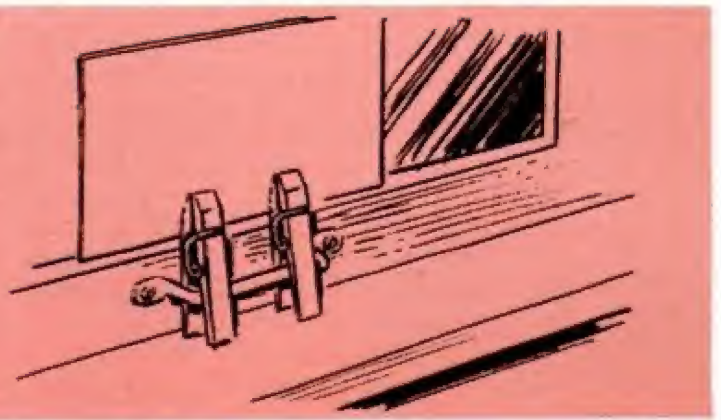


**NEED AN EXTRA SHELF** in your garage? Fasten a cleat to the studs, then notch a piece of scrap plywood to fit between the studs and nail it to the cleat



**CEDAR CHESTS** gradually lose that cedar odor and require "recharging." To do this, drill blind  $\frac{1}{4}$ -in. holes in the bottom and add oil of cedar to each

**OUTDOOR THERMOMETER** can be made by removing thermometer from an advertising calendar, placing it in a plastic bag and sealing bag with cellophane tape



**TO DISPLAY A SIGN** in the window of your home, attach a couple of spring-type clothespins to the lower edge and slip them over the window sash lift

**MAKE A DECORATIVE** pad for use under potted plants by placing a lace or plastic doily over a disk of brightly colored paper, aluminum foil or cloth

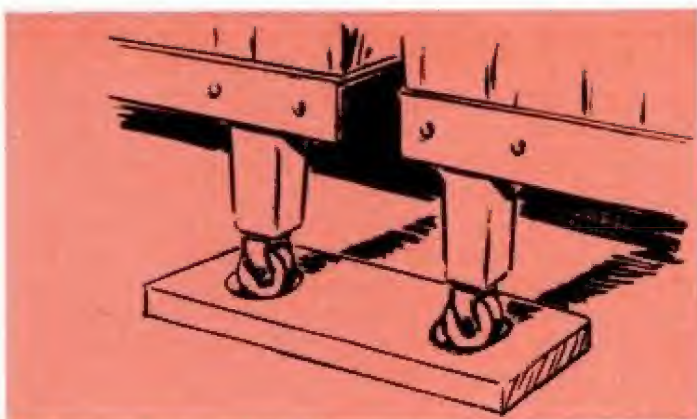




# HOME PROBLEMS



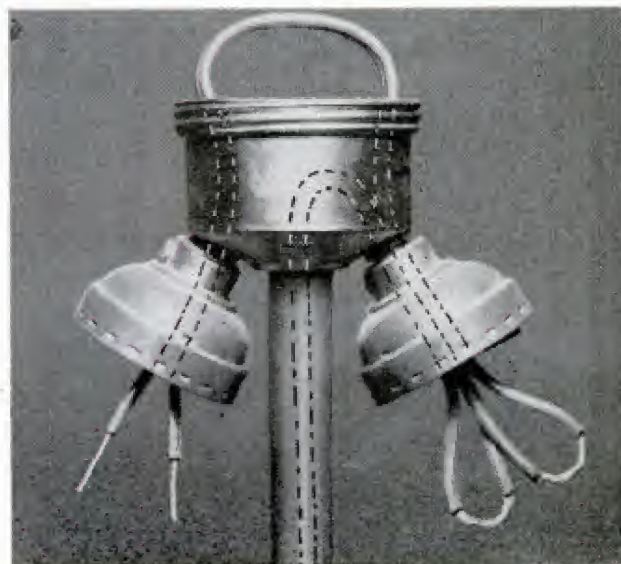
**YOU'LL FIND THAT** the metal cutting strip from a wax-paper box makes a perfect tearing guide for removing coupons, recipes, etc., from magazines



**TO KEEP TWIN BEDS** locked securely together, make a simple holder by drilling two holes just large enough for the casters in a piece of  $\frac{3}{4}$ -in. stock. When beds must be made, simply lift the caster at the foot of the bed out of its hole and swing the beds apart, pivoting on the leg at the head

**FOLDING HANDRAIL** can easily be added to your stepladder. Make the rail itself from a length of 1 x 2, and attach it as illustrated, using stove bolts with wing nuts. To fold the rail down, remove the bottom bolt with the wing nut and loosen the others. After folding, replace the bolt in its hole for safe keeping

**WHEN REWIRING** a lamp cluster, you can avoid that rat's nest of splices by looping the cord through the first socket, removing enough insulation to make the connection and continuing on to the next socket. This technique can be used on any multiple-socket lamp except those with three-way switches







**SWIVELING PAD** in the use position. Swinging bracket, detailed below, attaches it to drill-press column

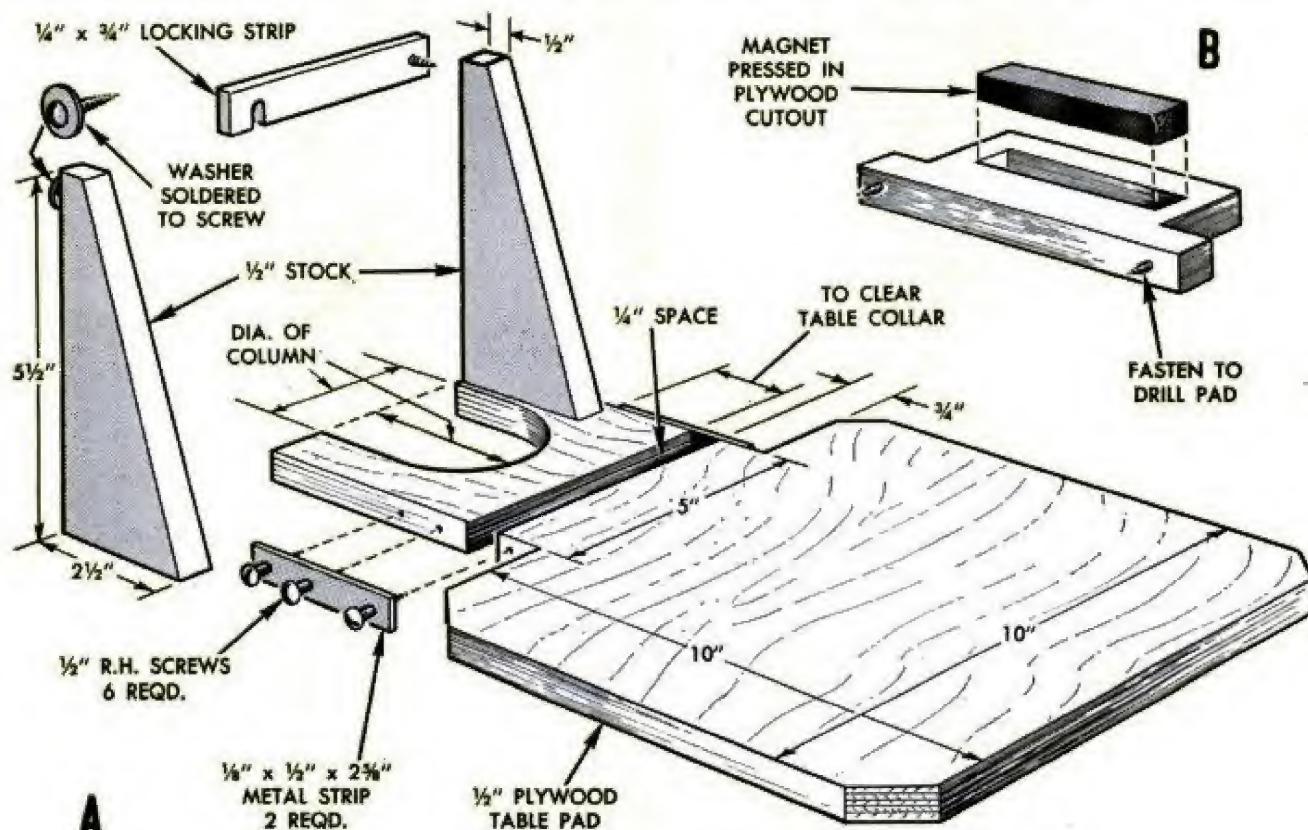


**HERE'S HOW** pad swings out of way when not in use. It is made from plywood to assure uniform thickness

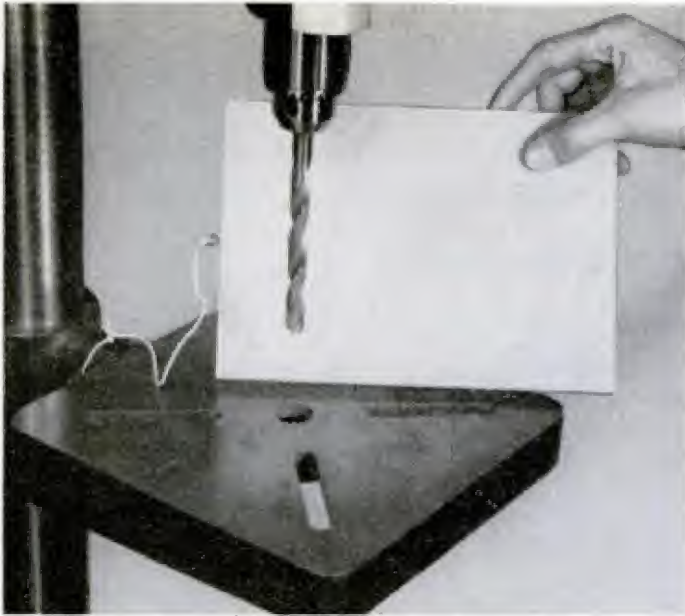
## Swing-Away Pads for Drill Press

WHEN DRILLING holes through wood or metal on a drill press you need a backup pad to prevent splintering wood or burring metal, also damaging the machine table when the bit breaks through. Of course, you can always grab a piece of scrap material and place the work on it. This makeshift will serve when all you need is a hole drilled through something. But when you

must be certain that the hole goes through perpendicular to the surface of the work this kind of thing won't do. Pictured above and on the opposite page and detailed below are types of swing-away drill pads that are always at hand when needed. You can rely on them for accuracy as they are of plywood which is of a uniform thickness. One of these, detail A, attaches to the column





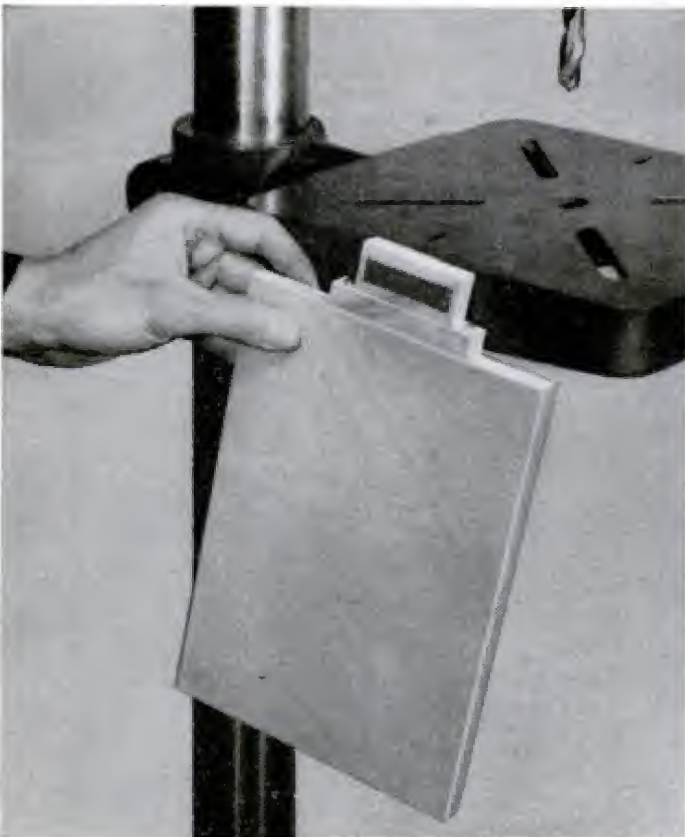


**ATTACHED** to the table arm or column with a cord, this pad is simplest of all, is always within reach

and swings away when not in use. Or, to simplify construction another attaches to the column with a length of cord as in the photo above. Better in some respects than either of these is the one having a permanent magnet which is press-fitted into a bracket screwed to the edge of the pad as pictured below and detailed at B on the opposite page. The magnet holds the pad on the side of the table when not in use.

—Richard Hanscom

**BEST OF THE THREE** in some respects is this pad with permanent magnet to hold it anywhere, in any position



## SHOP SHORT CUTS



### Have Clamps—Will Do

When you need a planing stop and there's no vise handy, arrange two C-clamps and the workpiece as pictured and you have the planing stop, even a vise of sorts in an emergency. If the nature of the workpiece makes it necessary to clamp it with the finish side next to the first clamp, drop a piece of thin stock between the workpiece and the clamp jaw to prevent denting when you draw the second clamp tight. Obviously, this kink is suitable only for small workpieces.—Daniel Bousha

### Nonslip Stick

Sure, you've had it happen—you're cutting a piece of glass and you're just half way through that sweeping stroke when the guide stick slips and away goes the score—off at an angle before you can stop the stroke. Nothing to do but start over again, on another piece of glass. This time stick a length of friction tape to one side of the yardstick, or whatever you're using as a guide, then, lay it on the glass with the tape side down. It won't slip.

—Charles Carroll

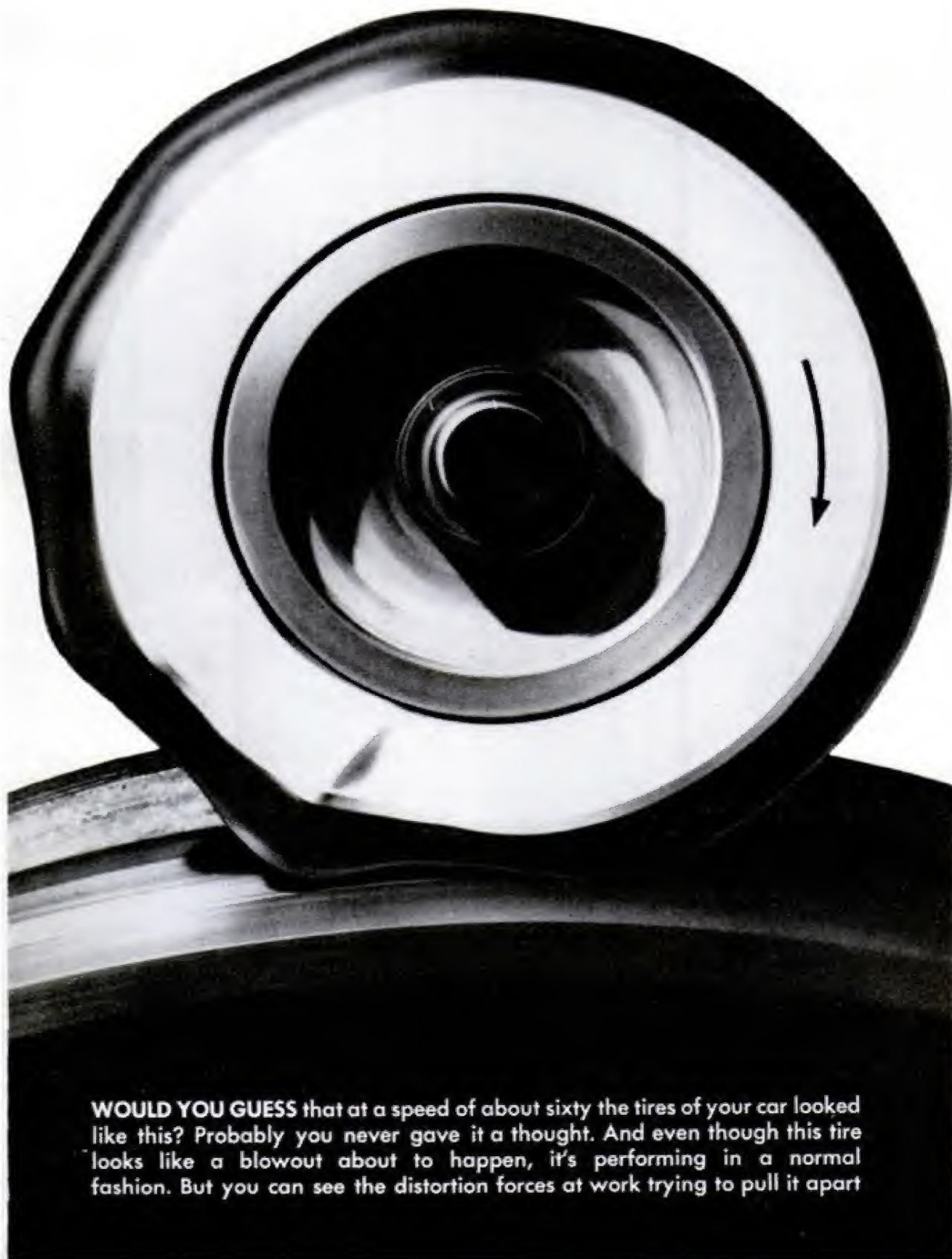




# TIRES TAKE A BEATING

*Often just one more precaution against tire wear than you now practice can mean 1000 to 5000 more miles from those rubber shoes on your car*

**By Morton J. Schultz**



**WOULD YOU GUESS** that at a speed of about sixty the tires of your car looked like this? Probably you never gave it a thought. And even though this tire looks like a blowout about to happen, it's performing in a normal fashion. But you can see the distortion forces at work trying to pull it apart





**UNDERINFLATION** is perhaps commonest cause of tread wear at edges, arrows. Underinflation is also cause of excessive heating of tire at sustained high speeds



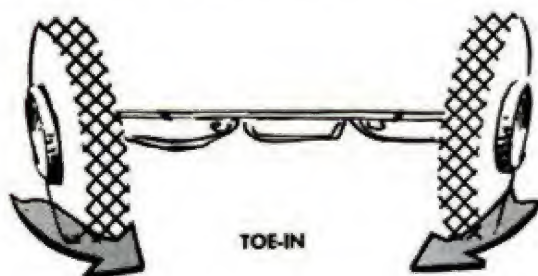
**OVERINFLATION**, not so common, causes rapid wear at center of tread, arrow. Similar wear of overinflated tire is accelerated by hard cornering and braking

**M**ANY OF THE conditions affecting tire wear can be controlled; some cannot. Environmental conditions, which cannot always be controlled have a more or less direct bearing on the mileage you get from tires. For example, a car driven continuously in hilly areas where roads wind, climb and descend grades generally will show more tire-tread wear than will the same car driven over roads which are more or less straight with few hills and curves. You'll get longer tire service when driving on the open highway at normal speeds than you will from the start-stop-turn driving one must do in town. The more you turn the steering wheel and the greater the load put on tires by stopping, starting and braking, the greater the tread wear.

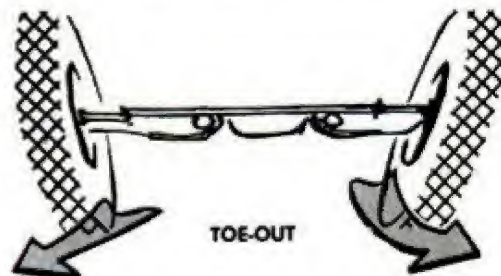
The surface condition of the road also affects tire wear. Roads surfaced with gravel and certain other loose surfacing materials may become rutted and have deep holes that cut tire treads or actually break the sidewalls. The size of the cut has no direct

bearing on the hazard that may be present, as the smallest cuts or breaks may be more serious than larger ones. It's the depth of the cut that matters. A cut of any size should be investigated immediately to determine its depth. Press the blade of a screwdriver into the cut, being careful not to widen or deepen it. If the cut extends into the cord body, it is best to discard the tire, as there is danger of a blowout.

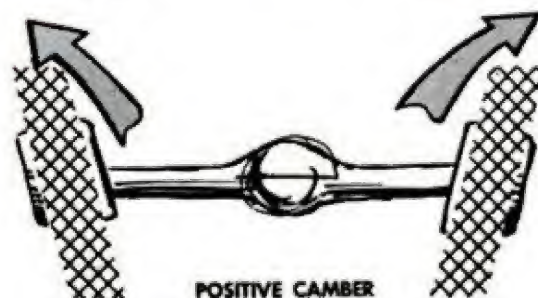
Hidden within the tire, surrounded by rubber, are fabric cords that can break under impact. Impact can damage a new tire as seriously as one that has given considerable service. Determining factors in the extent of impact injury are the size and shape of the object hit, the angle at which it was hit, and the force of the impact. Most often, impact injuries leave an X-mark or a straight-line break in the cord body. It is nearly always difficult to determine with certainty the degree and location of impact damage. It can cause a blowout or a flat long after an object is struck, leaving a driver wondering why and how it hap-



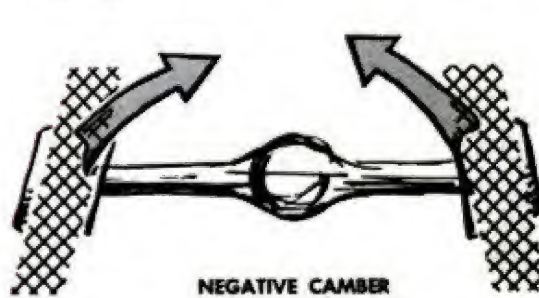
TOE-IN



TOE-OUT



POSITIVE CAMBER



NEGATIVE CAMBER

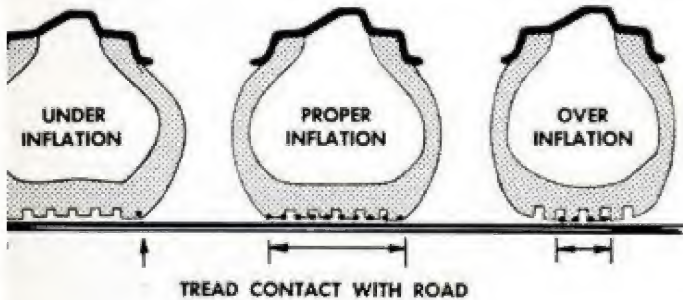




**TIRE AT LEFT** should be discarded, can skid dangerously on wet surface. Tire at right, although tread is uniformly worn, should be retreaded at this stage

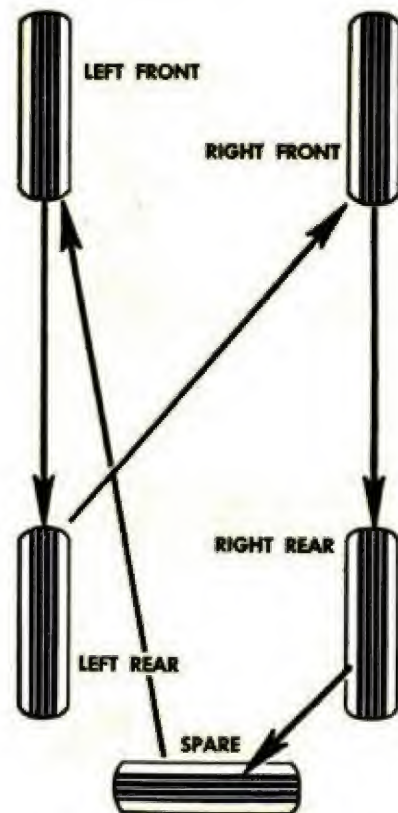


**ONE-SIDED TREAD WEAR** usually is caused by improper caster or camber of front wheels. If either angle is excessive, tread will be worn bald within short time

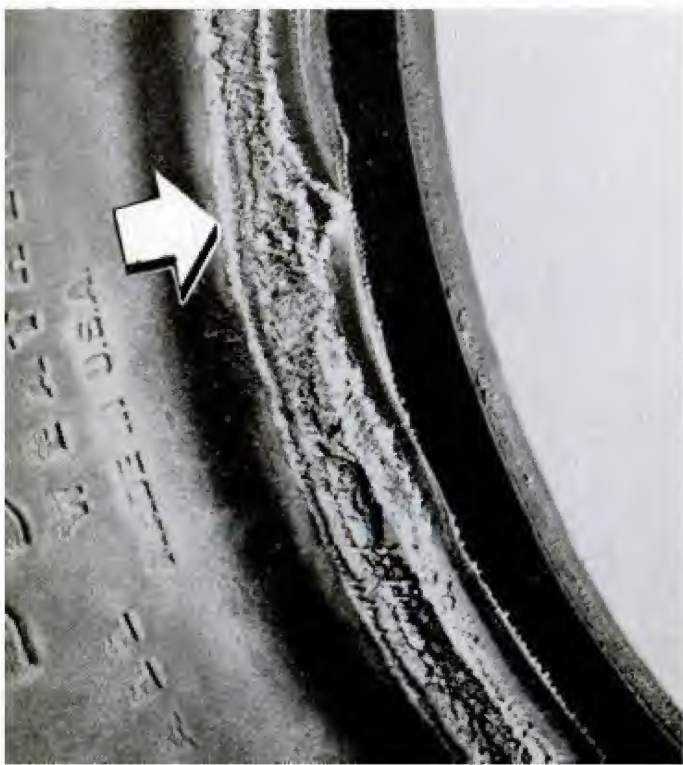


**HIGH SPEEDS**, hard cornering and braking causes rapid wear similar to that caused by underinflation

**FORCING TIRE** over bent, defective or improper size rim damages bead. Ordinarily, tire should be discarded



**ROTATING** tires every 5000 miles can get you 10 to 30 percent more mileage per set



**LONG CHANNEL CRACKS** at the center of the tread between ribs usually indicate a defective or inferior tire





pened. An impact break by itself usually does not cause a blowout immediately but constant flexing increases the size of the injury until failure occurs.

In tubeless tires, impact damage usually results in a slow leak, instead of a blowout. Slow leaks (called "slowouts") should be investigated immediately and repaired, if possible.

Impact damage is more serious in tube-type tires and is harder to pinpoint. Tubes, being elastic and full of air, stretch and press tightly against the inside of the tire body, working their way into the impact break. Eventually, the tube is pinched and chafed by the break and blows out. These conditions are more or less under driver control and emphasize the need for careful driving and maintaining proper tire pressure as insurance against damage.

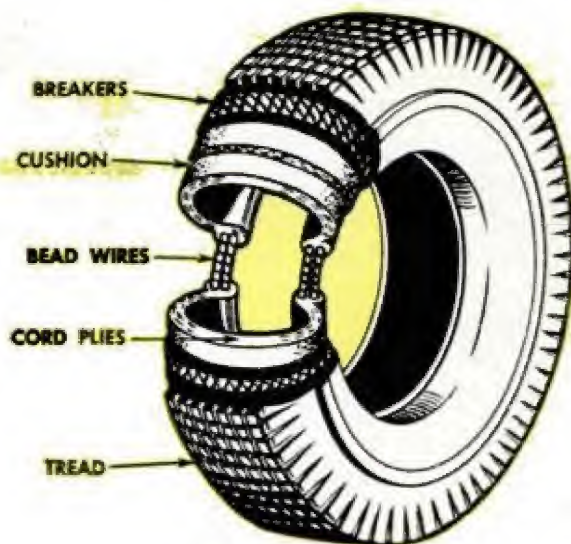
One other environmental condition injurious to tires is the grease, oil, and other petroleum products on the road and in parking areas. Petroleum causes rubber to soften and deteriorate. Where possible, avoid parking in grease or oil-soaked areas. Inspect tires periodically and wipe off any grease or oil. It is good practice to inspect the tires every time your car is greased. Close examination will disclose nails, bruise damage, and cuts.

Mechanical maladjustments directly affecting tire wear are out-of-balance wheels, excessive or improper camber, toe-in, toe-out and caster. There are two main symptoms of out-of-balance wheels, which should be apparent to the driver. The first is an unmistakable tramp or road shock, usually accompanied by a thumping sound. It often occurs at higher speeds and usually is felt through the steering wheel as vibrations that increase with speed. The second symptom is a shimmy—a rapid side movement of the front wheels that causes a sidewise vibration of the front end.

When either of these symptoms is first noted it should be corrected by a dealer with wheel-balancing equipment. He will look for two types of unbalance: The first is static unbalance. This is detectable when the car is stationary as it is being tested on balancing equipment. It is this condition that results in wheel tramp and bounce.

The second is dynamic unbalance. This refers to a wheel being out of balance when it rotates; that is, it wobbles—tends to turn inward and then outward every one-half revolution. This is felt as shimmy. A loose steering assembly can cause a similar shimmy, but your dealer is not likely to mistake one for the other.

Camber (either negative or positive) refers to the tilt of a wheel and results in uneven wear on one side of the tire. When



**TYPICAL** cutaway showing everything from beads to tread that goes into construction of passenger-car tire



**EXCESSIVE CASTER** shown diagrammatically. Too much tilt of axle causes the tire tread to wear unevenly

**WEAR SPOTS** such as these usually are caused by failure to rotate tires. Also can indicate a mechanical irregularity or underinflation, or all three causes





camber is present, the wheel is actually tilted at an angle to the ground. In negative camber the wheels are closer together at the top. In positive camber the wheels are closer together at the point of road contact. Both are readily apparent by inspection and should be repaired by an expert.

Toe-in refers to wheels on the same axle (front or rear) being closer together in the front than in the back. Wheels are perpendicular to the ground—they are not tilted as with camber—but they are turned in toward one another. If a toe-in condition cannot be seen by looking at the wheels, you can generally spot it by examining the tires. Excessive toe-in results in rapid wear on the edge of the tread, with most of the damage showing on the right side.

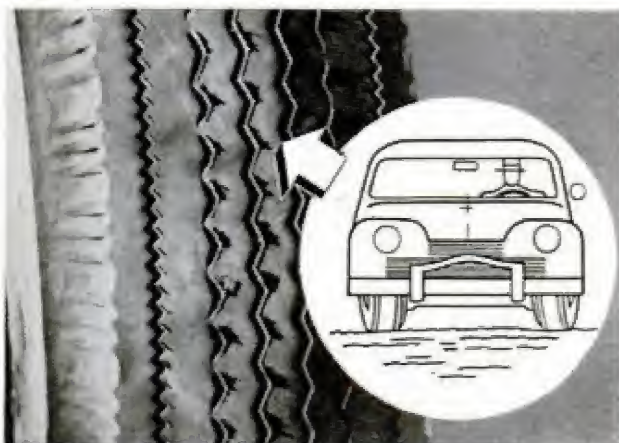
Toe-out is the opposite of toe-in. Wheels on the same axle are closer together in the rear than in the front. It is obvious that your car is toeing out when the tires show excessive wear on the outside edges of the tread, with most of the damage appearing on the left side of the tire. Toe-in and toe-out should be corrected by your serviceman.

Caster refers to the backward tilt of an axle or the tilt of the kingpin. Proper caster is essential. Too little caster causes wheels to wander, resulting in spotty tire wear. Unequal caster causes a wheel to pull to one side, resulting in excessive and uneven tire wear. Other mechanical irregularities affecting tire life that should be looked for and repaired are grabbing brakes, worn shock absorbers, sprung axles, sprung axle housings, worn bushings, and bent wheel disks.

When your serviceman mounts a tire he will, 1) inspect rim flanges for sharp dents. 2) Clean rim flanges and bead seats with emery cloth or coarse steel wool. If the flange is rusted, he will wire-brush it. 3) Inspect the butt weld in the rim and if necessary, file grooves and high spots flat

(Continued to page 194)

**FEATHERED RIB EDGES** usually are evidence of wheel misalignment. Wiping action causes rapid tire wear



## COMMON TIRE DAMAGE

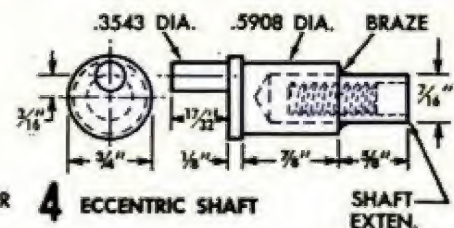
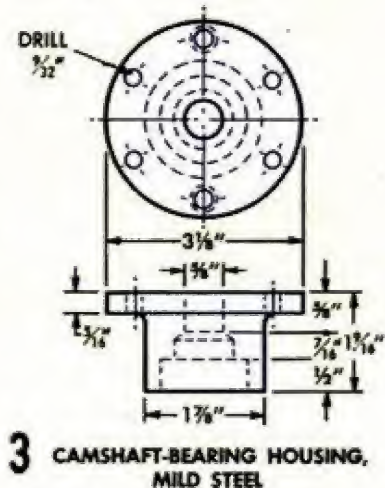
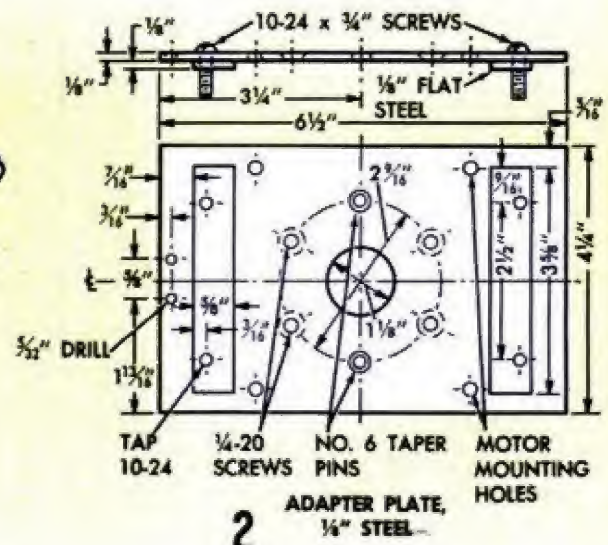
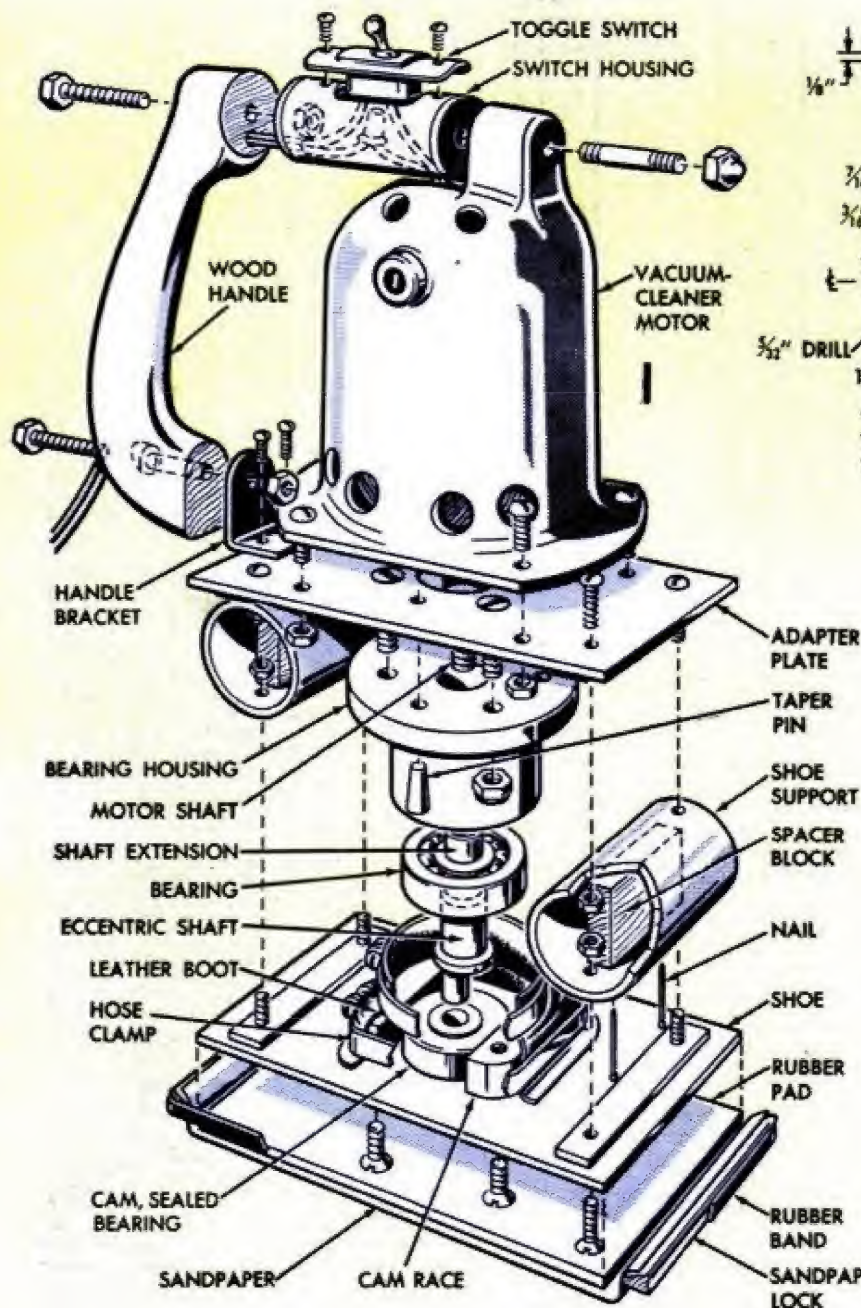
MALFUNCTION	CONDITION		SYMPTOM	USUAL CAUSE
	Mechanical	Driver		
Cut by chains		X	Gouge marks all around tire sidewall.	Incorrect-size chains or tire underinflated.
Cut due to spin		X	Cut from lower shoulder to upper tread edge.	Spinning tire against sharp rock frozen in icy pavement or on dirt or gravel road.
Cut by obstruction on vehicle	X		Chafe marks in straight line all around tire circumference.	Tire rubbed against disengaged vehicle part, such as bolt head from loose bumper or some other loosened metal was forced against tire while driving. Also caused by spinning wheels on rough ground.
Cut through shoulder			Small, sharp clean cut in shoulder area.	Striking small sharp object with enough force to drive it into tire. Often occurs far down on sidewall.
Cut through tread			Small, sharp clean cut across tread area.	Usually caused by sharp stones or wedge-like splinters of glass.
Cracking between ribs of tread			Small cracks around tire between tread.	Considered a natural condition. Safe to continue tire in service since cracks will not grow larger.



Channel cracking				Long cracks between ribs of tread.	Usually seen at more than one point. Condition is quite rare. Check with your dealer.
Sidewall cracking				Long, circumferential sidewall crack.	Condition is quite rare. There was probably an improper flow of rubber in the mold during vulcanization. Does not affect tire service. Can be removed by light buffing.
Sidewall weather cracks			X	Many small cracks on sidewall.	Improper stationary storage of tire or vehicle. Often happens to spare tire not rotated. Continue in service until cracking becomes so severe, cord body is exposed.
Radial cracks on sidewall and shoulder			X	Small cracks perpendicular to sidewall and extending to shoulder.	Rubber fatigue or improper inflation. Check with your dealer.
Outside circumferential cracks at shoulder				Several small cracks in shoulder area. Also long cracks running around tire circumference where shoulder meets sidewall.	Condition is quite rare. Indicates an improper union between sidewall rubber and shoulder rubber. Check with your dealer.
Defective sidewall splice				Long vertical splice starting at bottom of shoulder and running into sidewall. Edges of splice are smooth.	Condition is quite rare. Check with your dealer.
Open tread splice				Appears as a severe cut straight across the tread. A cut of this size, though, would have penetrated the tire completely.	Condition is quite rare. Check with your dealer.
Underinflation wear			X	Tread worn down excessively on both sides of tire between tread center and tread edges.	Underinflation.
Overinflation wear			X	Center ribs of tread are worn down considerably more than outer ribs.	Overinflation.
Spotty wear			X	Wear spots over the entire tire.	Failure to rotate tires.
One-sided wear		X		Wear evident on one side only. Could be left or right, depending on misadjustment.	Improper caster or improper camber of front wheels.
Misalignment wear		X		Feathered edges of frayed rubber along each rib of tread.	Toe-in or toe-out. Only a comparatively few miles of driving with this condition can cause severe tire damage.
Large, worn tread area		X		Large area badly worn.	Out-of-round brake drum or brakes out of adjustment. Only half the tire does all the work in braking.
Damaged bead area		X		Appears as if great friction had been applied to bead area.	Bent, defective, or improper-size rim.
Broken bead		X		Bead becomes lodged in rim well. Air pressure forces bead up on rim ledge with such impact that the bead wires are broken. Tire with a broken bead will not stay on the wheel.	Not using soap solution or recommended tire lubricant when mounting tire on rim.
Break on sidewall			X	Long jagged break at shoulder of tire.	Rim flange crushed and pinched tire sidewall against a curb or similar obstruction.
Break on sidewall			X	Long jagged horizontal break well down on sidewall and often surrounded by chafe marks.	Tire scuffed against curb or similar obstruction.



## VACUUM-CLEANER MOTOR DRIVES



***Has resistor-controlled motor, ball-bearing drive and quick-change abrasive holder. Requires only two machined parts***

**A** VACUUM-CLEANER MOTOR of the older flange-mounted type powers this reciprocating pad sander. It does straight-line sanding with any of the common abrasives, coarse, medium and fine grit, and is sufficiently powerful to maintain sanding speeds even though you may tend to bear down a bit to hurry the job. Its high performance rating is due to reduced motor voltage and the reduced speed resulting from the use of wattage-dropping resistors in series with



# THIS EFFICIENT PAD SANDER

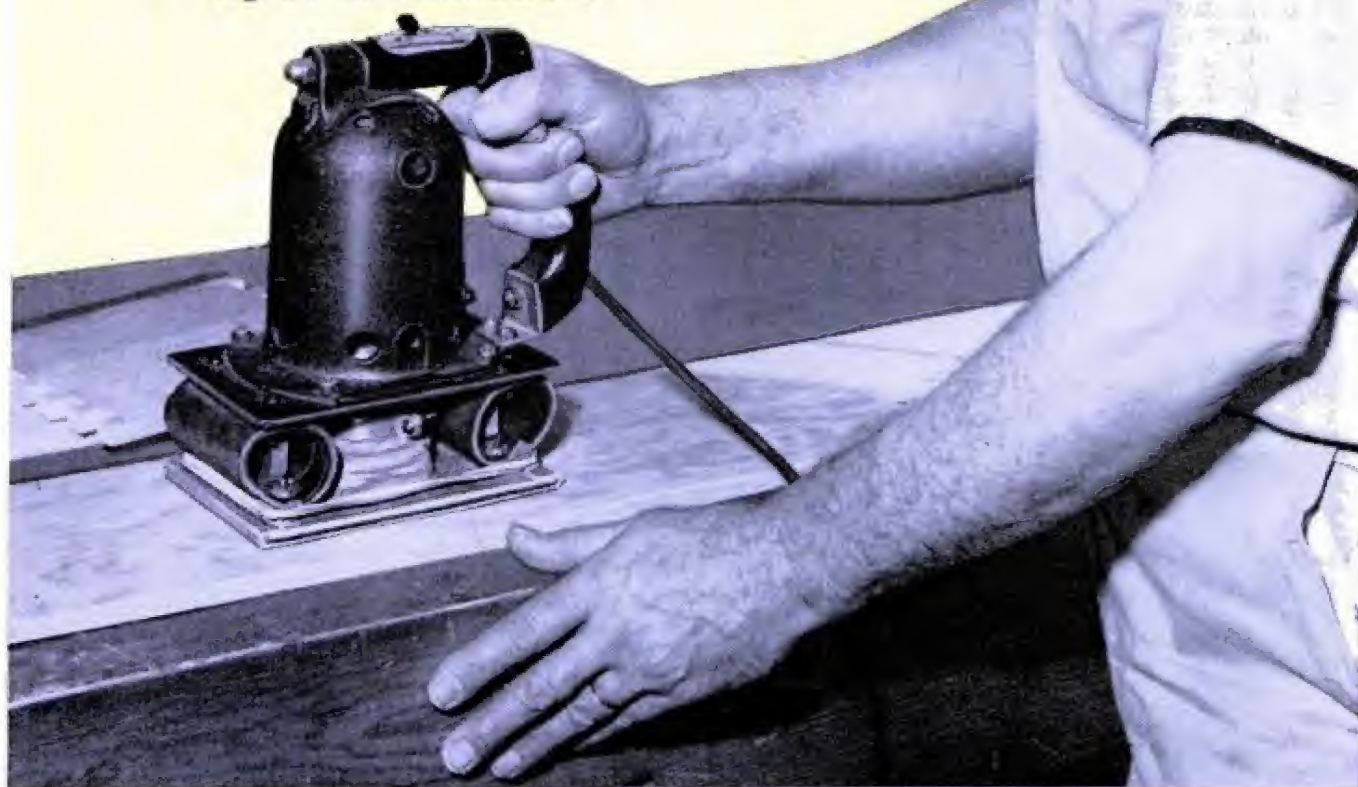


**SHEET-METAL CASE** provides space for sander, resistor assembly and assorted sheets of sandpaper

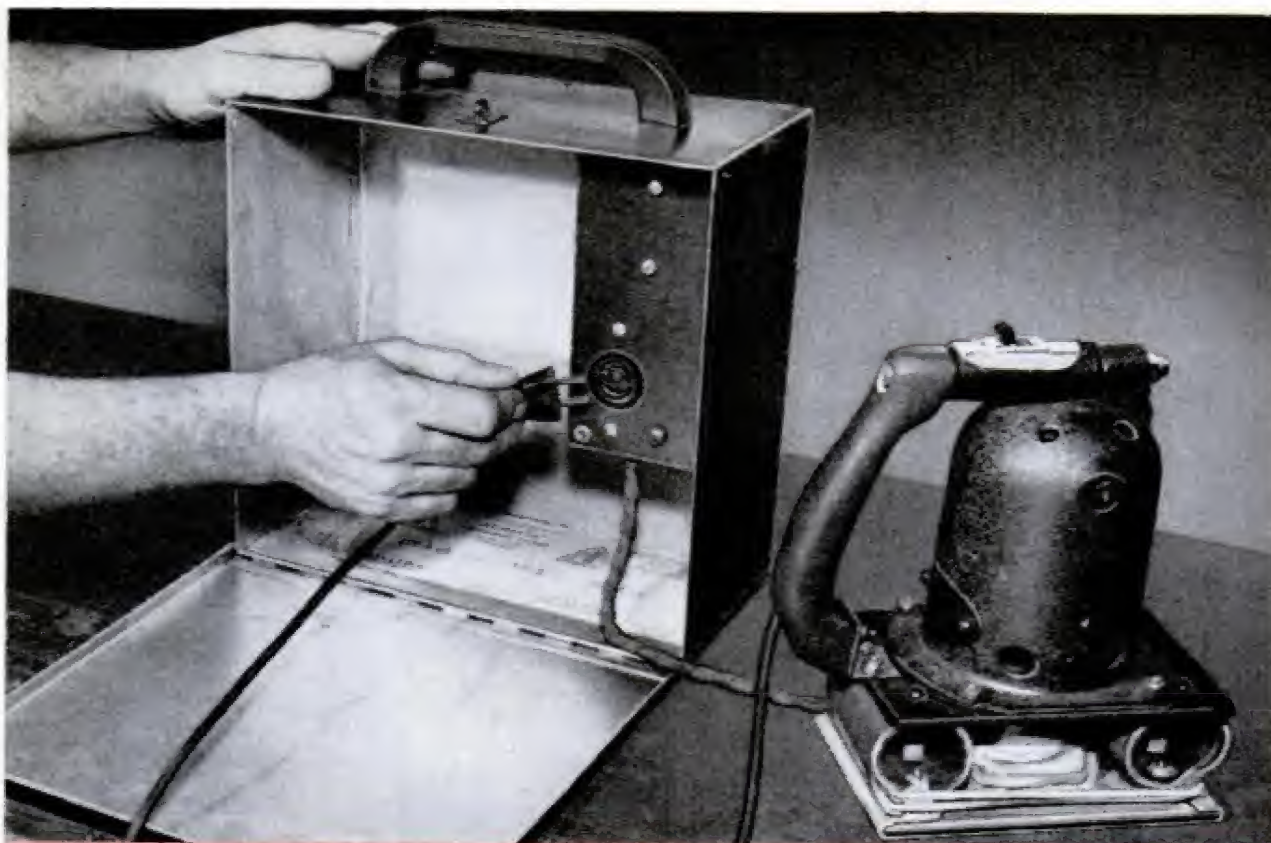
the motor. This setup practically eliminates speed variations in relation to the load, giving the vacuum-cleaner motor much the same operating characteristics as those of a constant-speed motor.

The motor you select should have a smooth, small-diameter housing like that pictured; it should be of the type designed for flange mounting and it also should have a threaded shaft and impeller (fan) retaining sleeve. Figs. 1 and 6 give you a good

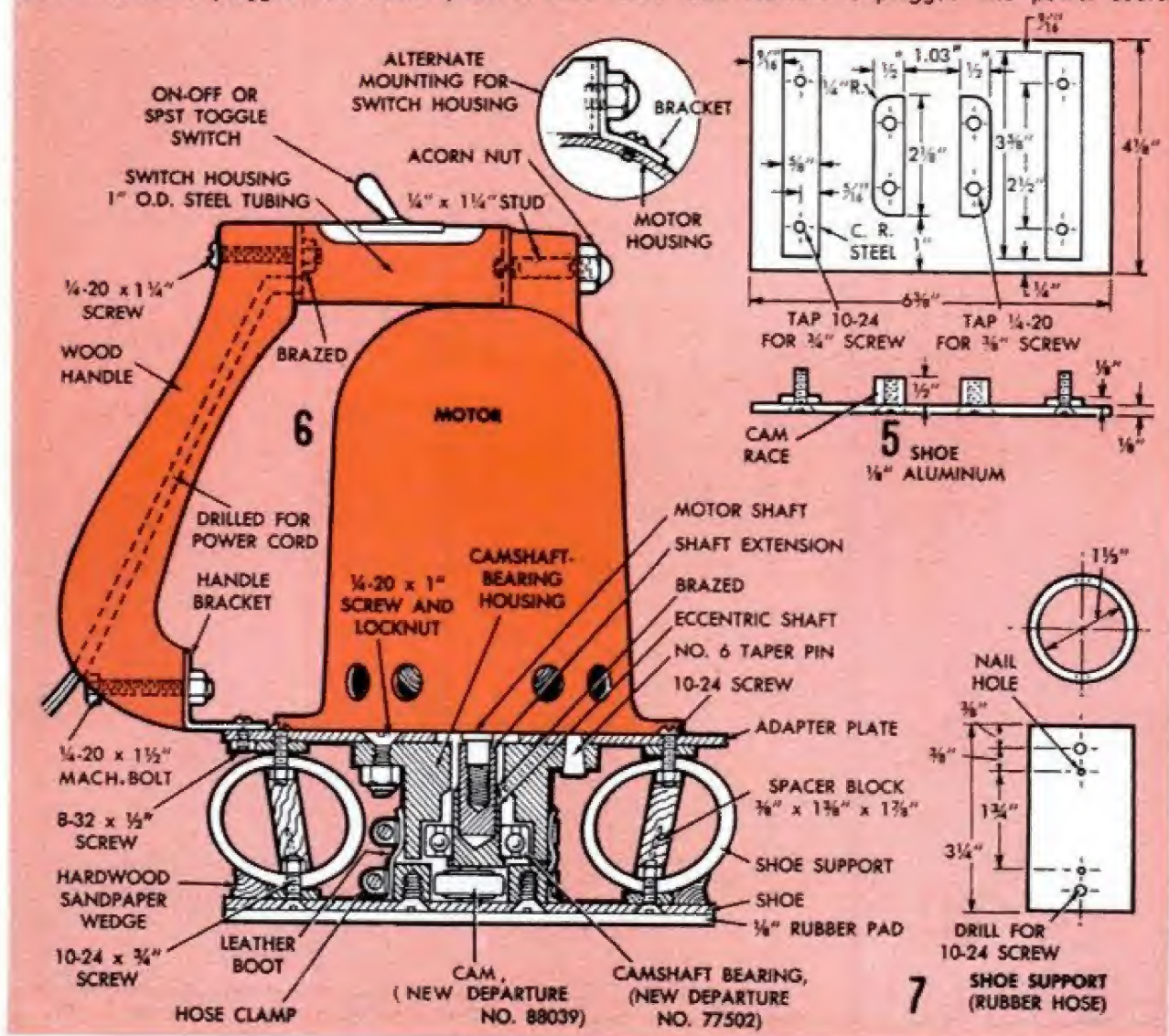
**By F. L. Greenwald**







SANDER CORD is plugged into resistor panel in case. Cord from resistors is plugged into power source





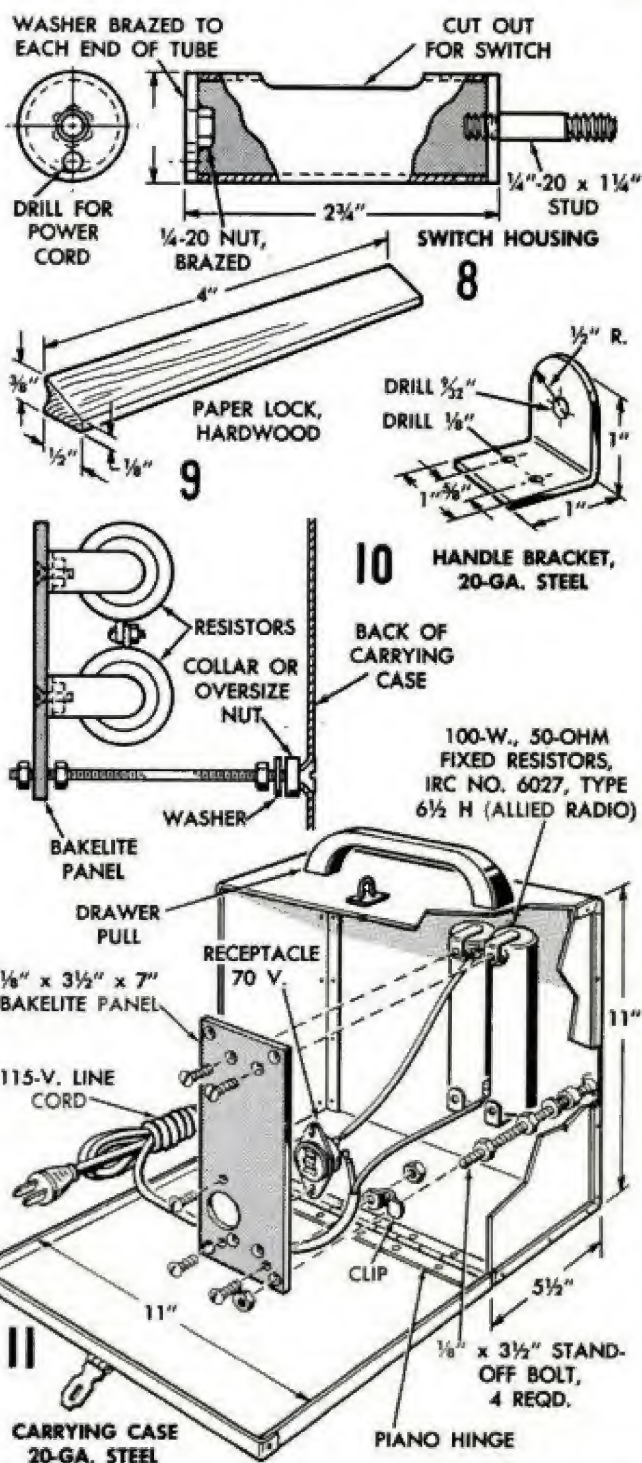
**RUBBER BANDS** snapped over hardwood wedges, right, hold sandpaper sheet tightly stretched over the pad

idea of the construction of the original sander. In Fig. 1 you see it pulled apart and in Fig. 6 you see the assembly in section. Most of the dimensions given on the parts can be altered to suit older vacuum-cleaner motors of the same general type as that pictured but there are several points to be kept in mind when changes must be made. For example, the width of the wood spacer blocks, Figs. 1 and 6, must be such that the end of the eccentric shaft, or camshaft, clears the shoe, Fig. 5. Also, it is possible, of course, to lock the camshaft (eccentric) to an unthreaded motor shaft with a setscrew, but in order to do so an access hole must be drilled through the camshaft-bearing housing, Figs. 3 and 6. If the camshaft is varied in length to suit a motor of somewhat different proportions than that pictured, then, of course, the length of the camshaft-bearing housing must be varied to suit. The camshaft diameter at the point seating the inner race of the bearing must be ground to the dimension given in Fig. 4. The same is true of the pin carrying the cam. Also, the shoulder seating the outer race of the camshaft bearing should be machined and ground to provide a press fit, so the bearing won't loosen.

Before you begin making parts, have the motor at hand and note these important points in the assembly: First, that parts are aligned with taper pins, Figs. 1 and 6, the pins passing through the flange of the camshaft-bearing support, through the adapter plate, Fig. 2, and into the flanged motor housing. Second, that for the cam specified (New Departure Sealed Bearing No. 88039) the  $\frac{1}{2} \times \frac{1}{2}$ -in. mild-steel bars forming the cam race must be located parallel and precisely 1.03 in. apart on the top face of the shoe, Fig. 5.

Before final assembly make a test assembly to check on alignment of motor, adapter plate and camshaft-bearing housing. If this checks out, then put together the shoe supports, Figs. 6 and 7. The supports are lengths of rubber hose bolted to the shoe and the adapter plate. A hardwood spacer block is centered and nailed inside each support. When the whole assembly has been made the spacers incline as in Fig. 6. In this position the spacer blocks should provide a clearance of about  $\frac{1}{16}$  in. between the cam and shoe. Before final assembly, place lubricant on the faces of the cam races and in the camshaft bearing. Fit a leather boot, Figs. 1 and 6, to keep dust and grit out of the bearing and the cam race. The boot is held in place with hose clamps, Figs. 1 and 6.

(Continued to page 188)







## COMING UP NEXT...

**PLAY-FURNITURE FROM SWEDEN.** It's kid-size all the way and from four of Sweden's best known designers. Complete group (some of which are shown above) contains nine versatile rainy-day toys for tots of preschool age. Pictured earlier in color in the May issue of *Good Housekeeping*, the September and October issues of *PM* will show you how to build them.

**HARDWARE 1962.** If you may be thinking of remodeling your kitchen, or just making it handier, you will want to brush up on what hardware manufacturers are offering to add eye appeal and make the kitchen a work room of work-saving gadgets. A showcase article in September will picture an array of items from hinges to hangers which you can find on hardware-store counters.

**RUBBER-BAND STERNWHEELER.** You can build it in your basement and take it out in your pocket—well, almost. It's a rubber-band-driven model of a famous river boat, the *Delta Queen*. Most of the intricate detail is simulated with paint.

**CONVERTIBLE BOAT TOP.** Outboarding purists may scoff at this buggy top for a boat but when you need to catch a little shade or a nap it's sheer comfort—a cozy refuge from a shower, too. You custom-build it to fit your boat.

**KING-SIZE BANDSAW TABLE.** Trying to cut a large workpiece on a small bandsaw can make you feel like a juggler with more balls in the air than he can handle. Next month we show how to make a table that gives your bandsaw a reach in feet instead of inches.



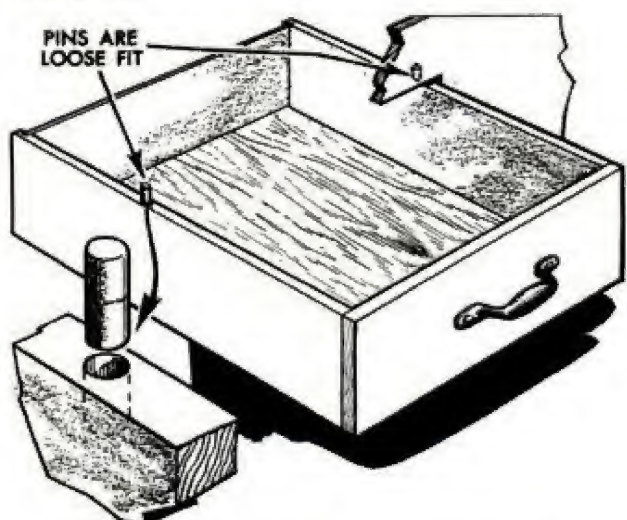
### Bike Park

As many as a half dozen bikes can be parked in a discarded metal-bed headboard of the type illustrated. The legs are set in concrete pillars as detailed, with the lower horizontal bar about 2 in. above grade level. Before setting the headboard in concrete, clean it thoroughly, brushing and scraping off any loose paint and rust. Then apply metal primer and two coats of enamel.

—Earl C. Hillhouse

### Drawer Stops

Likely you've had it happen—pull a drawer out hurriedly and cr-a-s-h! goes drawer and contents on the floor. Two short pins (dowel stock) fitted loosely in holes in the drawer sides will prevent such disasters. When you wish to remove the drawer, you simply reach in and pull out the pins.





### Trouble-Finding Signal Tracer



**PROBING** with signal injector produces audible tone in loudspeaker if stages to speaker are working OK



**USED WITH HEADPHONES** as a tracer, you actually hear the broadcast in the circuits if they are working

**By John Potter Shields**

**T**HIS LITTLE pocket tester lets you locate troubles in a sick radio set two ways.

Its small transistorized signal generator permits you to start at the loudspeaker section of a radio and work your way back through the antenna. Simply place the probe at the grid of each tube and proceed down the line until you no longer hear the oscillator signal at the loudspeaker. The stage after the one in which you last heard the signal would be the troublemaker.

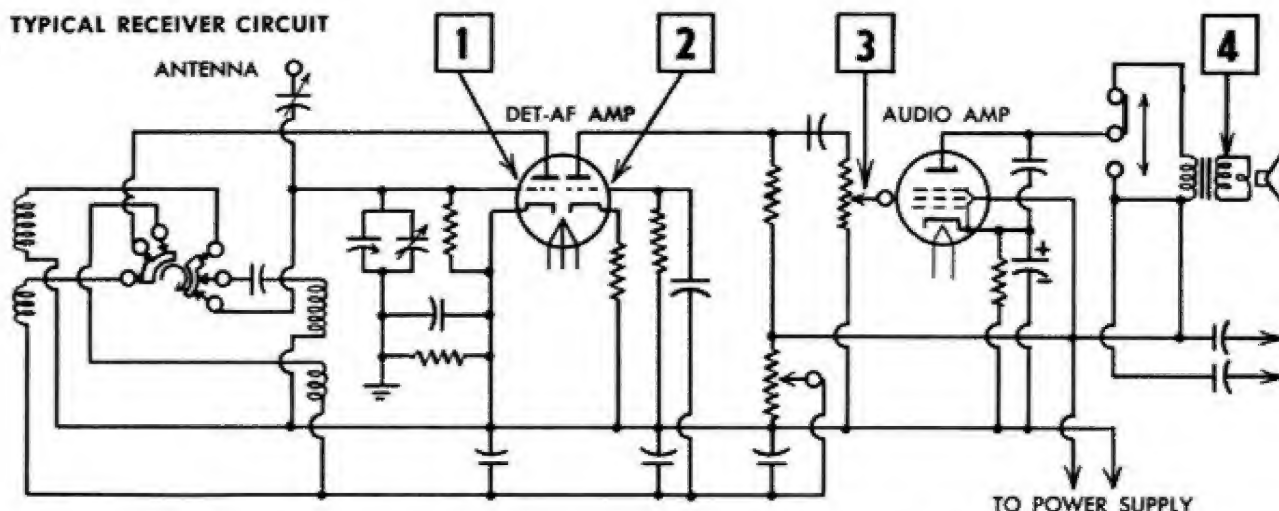
The unit can also be used as a signal tracer to double-check the location of the trouble. This time, start at the antenna, and work your way toward the loudspeaker, again, touching the grids of the tubes with the probe (see drawing top of next page). By listening to the earphone,

you can actually hear the broadcast signal (weakly, but definitely there). When you get to a point where a grid does not reveal any signal at all, you know that the previous stage is a sick one.

In constructing your signal tracer/injector, use any small plastic container for a cabinet. Begin by assembling the small component board. Lay the parts in place, and adjust the position of the parts with relation to the board until the most satisfactory layout can be obtained. The components are held in place by putting the lead wires through the holes and bending them until they are soldered, when they can be clipped. After locating the positions for the switch and jacks, mark the spot with a grease pencil, and then carefully using a soldering iron, melt through the



# TYPICAL RECEIVER CIRCUIT



**CHECK** step-by-step at circuit points numbered above. You hear a tone in speaker when using unit as injector, and hear broadcast signal in phones when signal tracing. Test at grids to avoid high plate voltages

plastic, forming a hole. Use a larger twist drill to remove the melted "burr." If you want to eliminate the jumper wire, you can replace it with a small slide switch. Then, in one position, you will have the signal injector, and can slide the switch to convert it to a tracer.

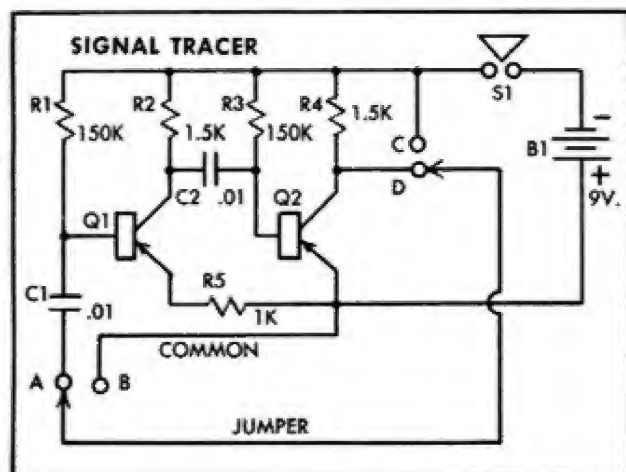
The probe used is merely a piece of #14 tinned buss wire, fitted with a miniature banana plug.

To test the signal tracer, connect a pair of 2000-ohm headphones (a miniature phone will do) to terminals C and D. Connect the jumper wire between terminals A and D. If the unit is wired properly, you will hear a loud 600-cycle note when you press switch S1. For use as a signal injector, remove the phones, leaving the jumper in place. Insert the probe in terminal A and connect a ground clip from the radio under test to terminal B.

## How the Tracer Works

When operated as a signal tracer, the input signal is applied to terminals A and B. Terminal A is hot, with B common. The

**TERMINAL POINTS A, B, C and D** (below) are miniature binding posts which connect with jumper wire



signals are introduced via a pickup probe and fed through capacitor C1 to the base of transistor Q1. R1 is a biasing resistor for Q1 and emitter resistor R5 provides negative feedback to Q1 to permit signals of any amplitude to be acceptable, and at the same time raises the impedance at the input of Q1, thus reducing the over-all loading effect.

Q1 amplifies the signals and these are drawn from the collector terminal of Q1 and fed to the base of Q2 via coupling capacitor C2. After amplification by Q2, the signal appears across collector load resistor R4 and is applied to headphone terminal D. The other terminal, C, connects to the negative supply, so the headphones shunt R4 when plugged into the unit.

When using the unit as a signal injector, a jumper wire is connected between the hot input terminal (A) to the collector output terminal of Q2 (D). This couples the amplifier input and output terminals, forming a free-running multivibrator. A 600-cycle signal is thereby developed at terminal A where it can be applied via the probe to the circuit under test.

The power supply is a miniature 9-volt battery. As current drain is slight, it should last for its normal shelf life. ★ ★ ★

## PARTS LIST

### RESISTORS

- R1—150K, 1/2-watt carbon
- R2—1.5K, 1/2-watt carbon
- R3—150K, 1/2-watt carbon
- R4—1.5K, 1/2-watt carbon
- R5—1K, 1/2-watt carbon

### CAPACITORS

- C1, C2—.01 mfd. disc ceramic

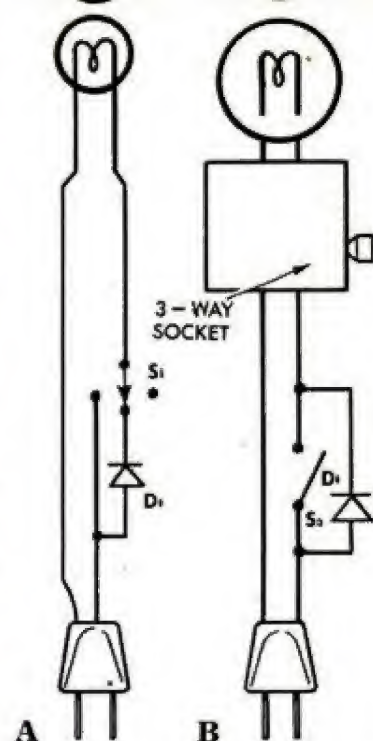
### TRANSISTORS

- Q1, Q2—2N322 or equiv.

### MISC.

- S1—miniature push-button switch (Olson Electronics #AS-473)
- B1—9 volt battery (Burgess 2U6) or equiv.
- Miniature binding posts (Olson Electronics #HW-34)
- Miniature banana plugs (Olson Electronics #HW-35)
- Perforated phenolic board (Olson Electronics #K-115)
- Push-in terminals, for making connections to circuit board (Olson Electronics #HW-5)





LAMP BASE must accommodate diode (see inset) and switch. A at right is for 1-way, B for 3-way lamps

## Dim-Bright Lighting From Ordinary Bulbs

Any standard lamp bulb up to 100 watts can be converted to three-way (off-low-high) lighting by replacing the on-off switch with a silicon diode and a three-position switch (see drawing).

In the first position, the lamp is off. In the second position, if you use a 100-watt bulb the diode will halve voltage to 50 watts of light. In position three, you get full brightness from full voltage because the diode is bypassed.

If you use a three-way lamp, you can add

the diode and an SPST switch (S2) in the base (drawing B above). The switch short-circuits the diode. When the switch (S2) is open, the voltage passes through the diode, reducing any of the three lighting levels by half. Diodes should be installed in the lamp rather than the wall switch controlling an outlet, as some sensitive devices could be damaged by half-voltage.

The diode is available for 98 cents from Lafayette Radio, 165-08 Liberty Ave., Jamaica, New York.

## Shin-Protecting Delay Switch

How many times have you sleepily focused, flipped the bedroom lights out and made what you thought was a bee-line for bed—only to have the bed frame smite your shins in the dark?

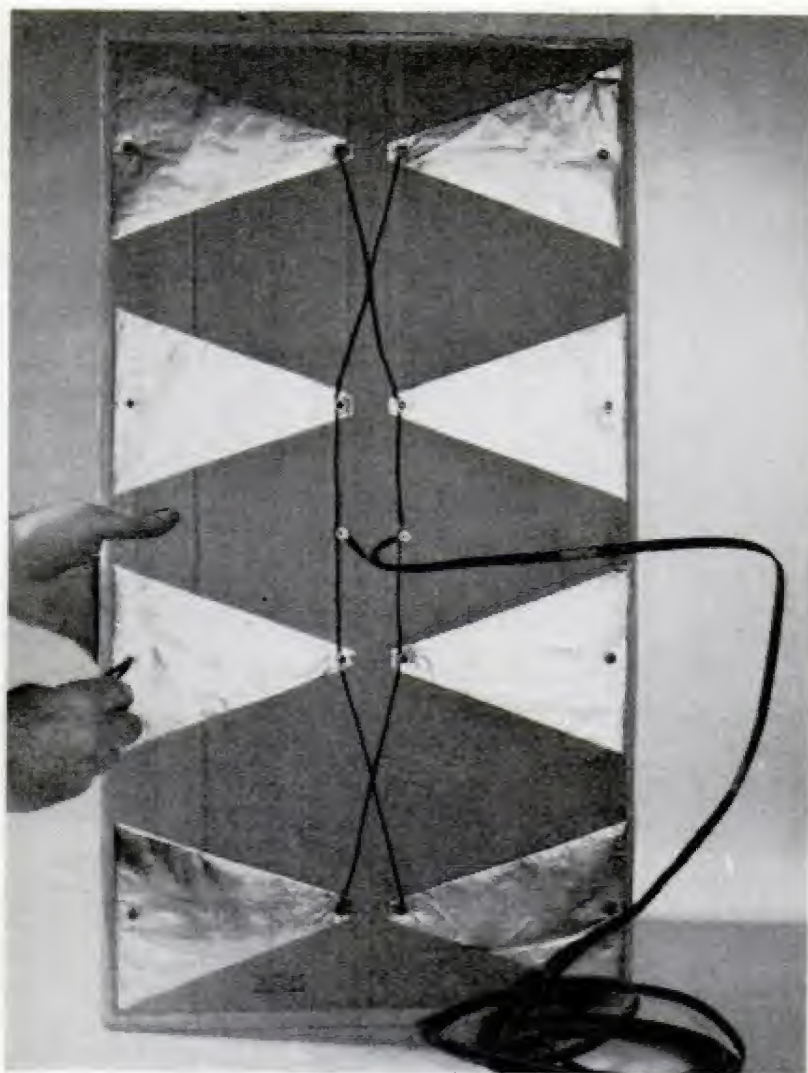
This switch (originally designed to keep garage lights on), makes an excellent shin protector for the bedroom, too. When installing it, first turn the old switch on, then remove fuses until the bedroom lights go out. This will insure you against electric shock. Remove the plate and the old switch. Put the new delay switch in, and replace the fuse. Restore the plate, activate the fuse again and you're all set. That night, calmly switch the light off, and you'll have time (30 to 60 seconds) to get into bed before the switch "clicks" and the lights go off.

The switch operates on a thermal delay principle, and requires no setting prior to installation. The switch (#35-B-526) is available from Allied Radio Co., 100 N. Western Ave., Chicago 80, Ill., for \$2.36.

AFTER REMOVING FUSE that controls switch, replace with delay type below, using a screwdriver as shown



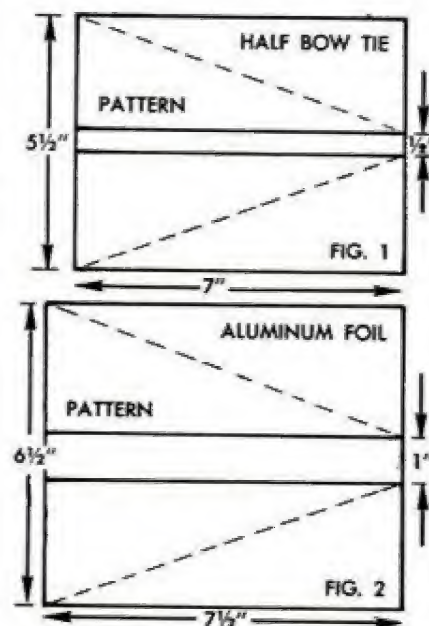




RUN LEAD-IN OFF at right angles. When making hook-up, wire connects to mounting bolts but there's no contact where wires cross



UNRETOUCHED PHOTO taken from UHF-TV 275 miles from UHF station



CARDBOARD BOW TIES (top) are wrapped in foil patterns (below)

## Bow-Tie Antenna Stretches UHF Reception

WITH 103 UHF (ultra-high-frequency) TV stations operating, many people still wonder what the advantages of UHF-TV are. Well, the ultra-high-frequencies have much less interference and the interference that does exist is easily filtered. It is true that UHF has a limited range, but as the FCC points out, a far greater number of UHF stations will offset the limited range of single stations. On the other hand, the proper antenna will provide the needed stretch for UHF reception. For example, the bow-tie antenna shown here stretched the normal 10-15-mile quality reception for UHF-TV to 275 miles!

You can convert your set in two steps. First add a commercial UHF converter to your set, and then this special antenna.

Use either corrugated cardboard or plywood as a base. Cut the cardboard fillers to size and then the aluminum foil patterns. After cutting the aluminum, wrap around the cardboard, and seal with pressure-sensitive tape. After assembling eight of these

half bow ties, place them on a 16 x 30-inch base. Space the small ends one inch apart, and separate the ties by two inches. Mount them permanently with 6-32 x 1/2-inch bolts and connect the ties as shown in the photo, using radio hookup wire.

As the antenna is directional, have someone watch the TV screen while you orient the antenna. As with all high-frequency antennas, the higher you place it, the better it will perform. Your attic will be a far better location than your downstairs living room. Once the antenna has been placed for optimum performance, check over several channels on your set and if necessary, reset the antenna direction.

—Thomas J. Hidley

### MATERIALS LIST

One piece corrugated cardboard or plywood, 16" x 30"  
One or two stiff cardboard boxes, depending on size  
One small roll aluminum foil  
One roll pressure sensitive transparent tape  
18 half-inch brass bolts, #6-32  
18 hex nuts, #6-32  
38 #6 brass washers  
Four feet insulated hookup wire  
Twin line, 300-ohm





*Air Force Recruiter to Paul Looney, New Haven, Connecticut*

## ***"Let's talk about your next few years."***

Today we live in the beginnings of the Aerospace Age. It is an increasingly technological age, with great rewards for skilled specialists. The Air Force offers qualified young Americans the opportunity to build exciting and rewarding futures in such advanced fields as aircraft and missile maintenance, electronics, administration, security.

If you recently have been, or shortly will be, graduated from high school, why not stop in

and talk with your local Air Force Recruiter? —or clip and mail this coupon.

*Attention honorably discharged veterans:* Take advantage of your military training through the Prior Service Program. You may enter the Air Force with your previous rank. Your local Air Force Recruiter has the details.

***For America's future, and your own,  
Join the Aerospace Team...***

## ***U. S. Air Force***

**Airman 3C Paul Looney** is now a Fire Protection Specialist, assigned to Plattsburgh Air Force Base, N. Y. Air Force Aptitude Tests had indicated this career field would be right for him. His performance record confirms it.



*Clip and mail this coupon today!  
Career Information, Dept. MM28,  
Box 805, New York 1, New York  
I am a citizen (or resident) of the U.S.A.  
Please send me your illustrated booklet.*



Name \_\_\_\_\_ Age \_\_\_\_\_  
Address \_\_\_\_\_ Phone \_\_\_\_\_  
City \_\_\_\_\_ County \_\_\_\_\_ State \_\_\_\_\_



# CLINIC FOR HOMEOWNERS

## Rust Stains in Sink

**Q**—I plan to remodel our bathroom this fall and install all new fixtures. I would like to use the old sink in a powder room downstairs, but it is badly rust stained around the drain. The enamel in this stained area is rather rough. How can I remove the stain and smooth the enamel?—E. D., Wash.

**A**—While it isn't possible to bring the stained area back to a like-new condition, you may be able to improve the appearance enough so that the sink will be usable. There are several commercial preparations available for removing stains from enamel, and you can probably remove some, or all, of the stain by using one of them. If the results are unsatisfactory, you might try applying peroxide to the stained area and sprinkling immediately with a kitchen scouring powder. Rub this mixture over the stain and allow it to stand for an hour or so. Then wash it off. Repeat this operation if the stain still shows.

When pitting is exceptionally bad, the only way to remove the stain is by abrading the surface to some depth with a commercial rubbing compound (available from your paint dealer). However, this will remove even more of the gloss and expose unsupported pigments contained in the original finish. Since the enamel finish is fired on the metal at very high temperatures, it isn't possible to patch or rub the pitted areas and match the glass-smooth original surface.

## Measuring Attic Louvers

**Q**—We recently moved into an older house, planning to remodel it from basement to attic. My remodeling schedule calls for removing the windows in both ends of the attic and replacing them with ventilating louvers, but I don't know how to determine what size louvers to use. The roof pitch is quite steep, and the attic space is high, long and narrow. Incidentally, what is the meaning of "free louver area"?—L. J., Wash., D.C.

**A**—Taking your last question first, free louver area is simply the area of the louver opening less that of the slats. The general rule is to allow 1 sq. ft. of free louver area for each 100 sq. ft. of attic floor space. However, in a high, long attic such as you describe, it's probably advisable to install louvers somewhat larger than this rule requires in the gable ends.

## Sick Lawn

**Q**—I've got a sick lawn. Last summer it turned grayish brown in July and didn't show any signs of life until late September. This year it's doing the same thing. How can I nurse it back to health?

—R. N., Ark.

**A**—From your description, we would say that your lawn is suffering from malnutrition. When the soil has become so depleted that it no longer will support even a moderate growth, the best medicine is generous quantities of seed and plant food. Start with a fertilizer application immediately as emergency first aid, and follow with a second application in two to four weeks. A third application late in September, plus a fairly heavy seeding, should put your lawn in good condition for winterizing. Be sure to use a nonburning fertilizer and apply it with a spreader since this will assure even distribution.

Water the lawn regularly only during dry spells. As a further aid to recovery, set the lawn mower to cut at least 1½ in. high. Don't remove the clippings after mowing, since they serve as a mulch to retain moisture. However, if you use a rotary mower and the clippings tend to bunch, scatter the bunched material evenly.

## Painting Stained Shingles

**Q**—The outside walls of our home are shingled. While the shingles appear to have been stained some time ago, they now show weathering and I am thinking about painting them. Is there any possibility of the old stain bleeding through the paint?—B.S., Mass.

**A**—If the old stain contained creosote, there is a possibility that it might bleed and discolor the paint. However, there are special shingle and shake paints which are said to resist bleeding effectively. Before you begin painting, we recommend that you consider staining the shingles again since this job might prove more satisfactory in the long run. In any case, go over the walls with a wire brush and remove all loose material before painting or staining.

As a service to Popular Mechanics readers in solving the hundreds of problems pertaining to a home—inside or out—you are invited to present your problems to The Clinic Editor for his helpful advice. Address your questions to The Clinic Editor, Popular Mechanics Magazine, 200 East Ontario Street, Chicago 11, Ill.



## Safe Round-Trip to Moon

Russia may get to the moon first, but the U. S. will be the first to land a man on the moon *and* return him safely, reported James E. Webb, administrator, National Aeronautics and Space Administration.

It will be necessary to land 30 tons of engine and equipment to return a six-ton manned spacecraft to Earth. More than 200 tons of equipment will be launched for the manned lunar expedition.

Although scientific knowledge is the main goal, the first man on the moon will be a science-trained astronaut, rather than an astronaut-trained scientist.

## Weapon Against Elm Disease

A potent new chemical for combating Dutch elm disease has been described by Dale M. Norris, assistant professor of entomology at the University of Wisconsin.

Called Shell 3562, the chemical is implanted in the vascular system of the elm, carried through the branches and into the bark tissue. It kills bark beetles which spread the disease-causing fungus.

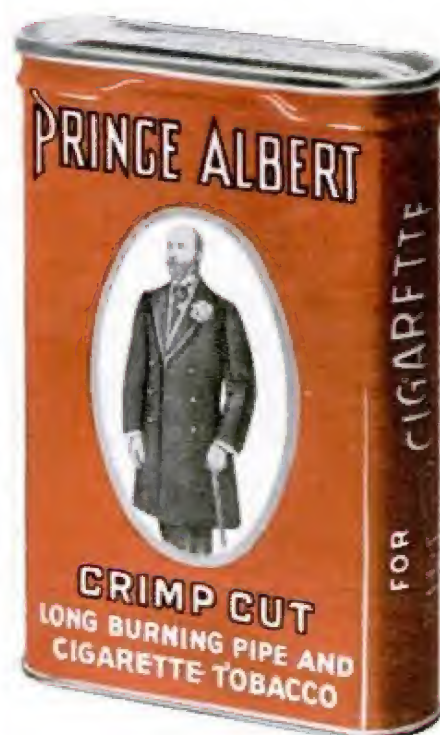
Since the chemical can be confined to the diseased tree without contaminating the area, the threat to wild life would be lessened, with the possible exception of sap-suckers and squirrels.

# The proof is in the puffing!



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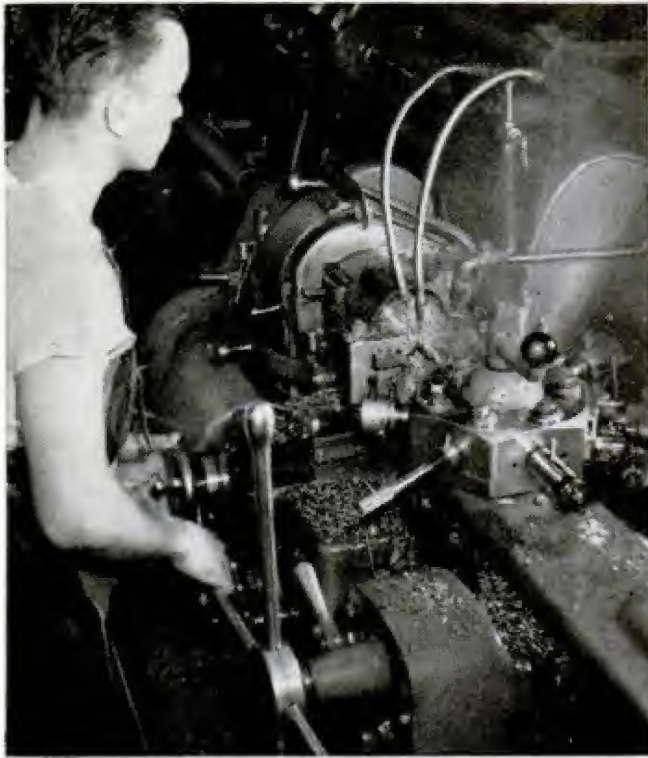
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## Wallops Island

(Continued from page 104)

over a long period and then released in a single, sudden blast—worth several million dollars.

One day, after the tunnel had been charged and they found that the model to be tested was not ready, Wallops people wondered what to do with the air in the tunnel. It had to be released to ease the strain on the huge tanks, but it seemed a shame to waste it. An engineer and a shop mechanic produced a hollow flat pan made of heavy steel. Several holes were in the bottom; a pipe was welded to the top. The mechanic attached a hose from the air-storage tanks to the pipe. The engineer released air from the tanks. The heavy metal plate rose from the floor and flew wildly at the end of its umbilical hose.

In the months to follow, teams of mechanics and engineers built many different shapes of flying pans and held contests for altitude, endurance and control. Then, visiting aircraft company engineers began looking on. But they did more than just watch. They made notes and sketches. Before long, several aircraft and automobile manufacturers were talking to the Army about their designs for radical new machines that used no wings or propellers, but were supported instead by air pressed downward by fans and compressors. Ground effect machines (GEMs) now seem to be a definite part of our future.

### Even Name Has Changed

What are Wallops people doing today? For one thing, they are putting to the final development tests the solid-propellant *Scout*, NASA's 72-foot research rocket developed at Wallops. It is this monster (compared with the small rockets that were used to launch aircraft models) that has caused the change in the way of doing things at Wallops. Even the name has changed to Wallops Station. Until *Scout* and some of the larger rockets appeared along with their permanent concrete launch pads, Wallops had no "destruct equipment" for destroying an off-course rocket. It would simply fizzle out harmlessly at sea. The word "Danger" was almost unknown, although "Safety" was the 24-hour rule.

And, something else they're doing today: cleaning up from last winter's freak storm that carried disaster up and then down the Atlantic Coast. Wallops was pounded heavily. The beach was lost, sea walls destroyed.

Even Wallops' reaction to the storm was

(Continued to page 176)



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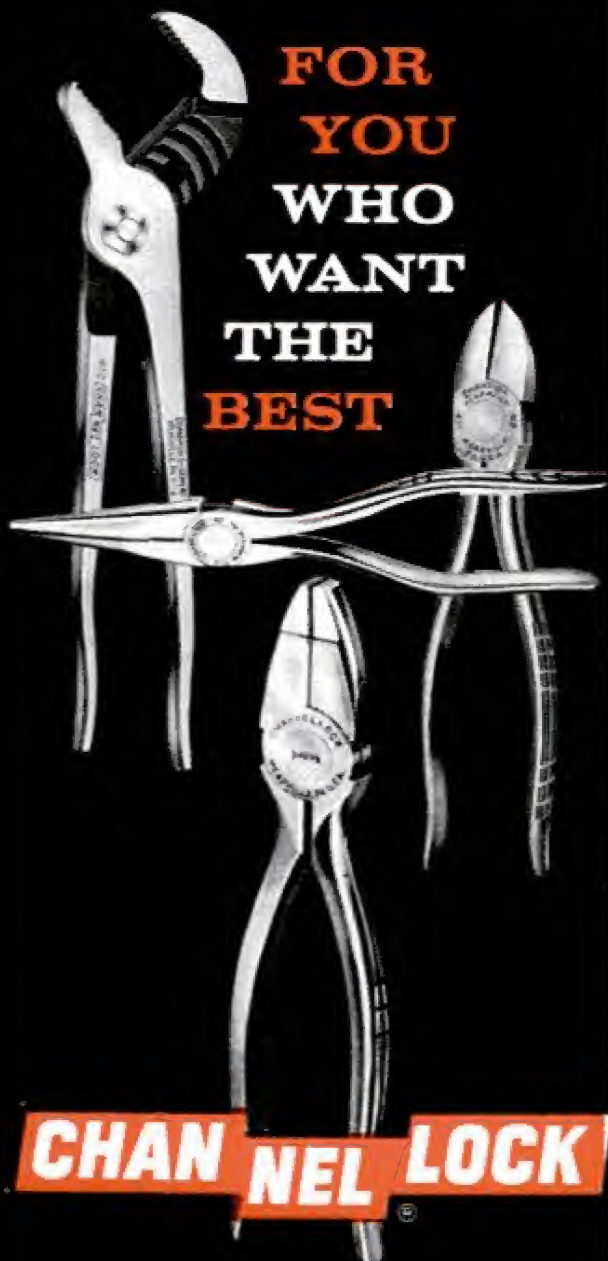
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in the spirit of the station's traditional informal camaraderie. Wallops had earlier expanded to include part of the abandoned Chincoteague Naval Air Station. After the storm passed and thousands of eastern-shore residents found themselves homeless, Wallops engineers and mechanics looked at their own wrecked station and then looked at the homeless fishing families.

"Let's get these people some shelter," Wallops people said. They dropped their work, piled into trucks and slithered along the wave-pounded causeway that has replaced the ferry as the tie to the mainland. Dozens of unused buildings of all description were available to choose from. Many were opened. The Wallops mainland cafeteria at the Naval station was put to 24-hour duty (once again cooks doubled in brass). Food stocks were good, but Wallops people managed to get into town and load trucks with food purchased on hastily arranged credit. They scrounged clothing and blankets and pillows.

The life-saving operation was well underway when a NASA headquarters official managed, after trying many hours, to reach Wallops by phone.

"Do what you can for the local population," he shouted hoarsely over the static-ridden lines.

"It's done," came the reply.

"We hear you've got some expectant mothers. How's your doctor situation?"

"We've got a couple of docs here from the county health department, and we've bought a lot of food and things from the stores in town."

"Good, but what are you using for money?"

"We'll figure that out later."

"Is there anything we can do?"

"Yeah. Tell us where to get a thousand diapers in a hurry." ★ ★ ★

## Senses Smoke in Seconds

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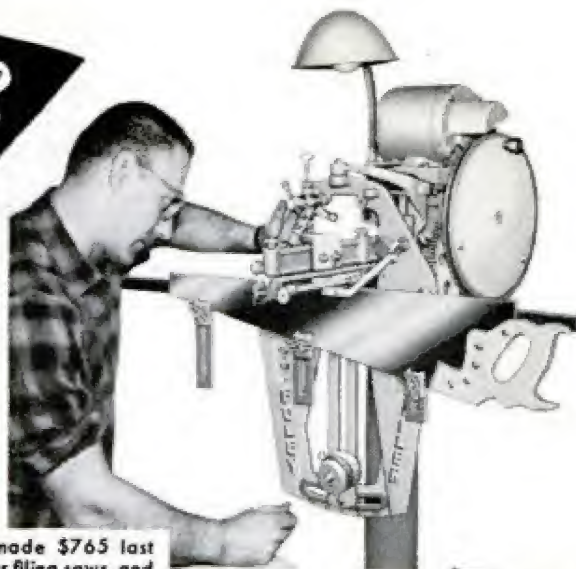
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## I Chased a Bogie

(Continued from page 114)

was scheduled for an afternoon alert, so I spent the rest of the morning getting suited up and checked out.

A pressure suit is no place for anyone with claustrophobia. All Air Force jets have pressurized cabins but, for high-altitude missions, these king-size corsets are worn, too. I felt like I was being squeezed to death and, when they put the helmet on, I thought I was in a custom-made coffin. A parachute goes on over all that and, when we found one to fit, I hobbled out to the plane for the cockpit check.

The first close-up sight of an F-106 is a shocker. No fact sheet coldly listing its size and performance (28 feet high, 70 feet long, speed more than 1500 m.p.h.) can prepare you for it. They are big, beautiful birds.

I sat down in the back seat of an F-106B, the two-seat version, and got a short course in how to panic. The first thing that strikes you is the smallness of the area and the maze of instruments that surrounds you. Already near-motionless from the pressure suit, I was crippled still further as they tightened the parachute straps until the suit wrinkled ("If they're loose, the jolt will break your leg when the chute opens," Hartman said amiably.) Over that came the shoulder straps and the seat belt, with an extra lanyard hooked up to the seat itself.

Now nearly paralyzed, I thought, "I'm going to break the damn sound barrier and I'll be too numb to feel a thing." And a trickle of sweat ran down my back.

### Taught How to Bail Out

When they closed the canopy momentarily, I knew how Lazarus must have felt. Hartman then taught me how to bail out.

"Reach down along both sides of the seat and you'll find two handles," he said. "When you bail out, just yank them hard. The rest is automatic. The canopy goes, the seat rockets go, you go. The seat stays strapped until you fall to 14,000 feet, then it blasts loose. The lanyard initiates a one-second delay, and your chute opens."

Then he made the most tasteless comment of the day. "You have to go first. If the man up front bails out ahead of you his seat rockets will burn you up. He won't wait very long, so you better be ready."

There was still one more thing, a subject referred to only vaguely. Some NORAD fighters are armed with atomic-warhead missiles. As I sat there, I knew the missile bay was just a few feet below and behind me. I asked Capt. Pugh if he knew what was in our bay, but he just smiled vacantly and changed the subject. I never did find out, but it's a weird feeling sitting there and

wondering just what it is you're sitting on.

After lunch, we suited up again and went to the alert room to sweat it out. One pair of pilots pulls a five-minute alert—they have to be off the ground five minutes after the horn goes—and another pair is on 30-minute alert. I was with the first pair.

About one o'clock we began a card game. At 1:40, as I was dealing, that man at Sioux Lookout spotted the blip. Before I had made made two discards, the horn went off. . . .

### INTERCEPTION

Scrambling is old hat to most Air Force pilots, and they can tell some hilarious tales about it. Like punch-drunk fighters primed to answer the bell, they are conditioned to jump up and start running when the horn goes. At one air base, so they say, the alert room had been remodeled and one pilot jumped up and crashed into a wall where the door used to be. Another leaped out of bed and started running in his pajamas when his 6-year-old son sneaked into the bedroom and blew a toy horn in his ear.

When the horn blew in our ears, Pugh and I and the pilot of the second ship started running. In that pressure suit, it was more like controlled stumbling. I came in third, but Pugh had other things to do while I finished strapping myself in. When he started the engine and closed the canopy, I could feel the sweat along my spine again. There was no turning back now.

Luckily, Pugh began his check-in routine while taxiing out, and I had to stop feeling sorry for myself and start taking notes.

"Duluth Tower. Victor November Red. Scramble two F-106s."

(Translation: Pugh called the airport tower, identified himself by code name, and asked for takeoff instructions.)

"Roger, Victor November Red. You are Victor November Zero One and Zero Two. Cleared TACAN scramble, two-nine-three radio outbound. Contact Majority, channel three. Gate climb, angles four-five."

(For the flight, our planes would be identified as VN-01 and 02. We were cleared for a tactical air-navigation flight, with a 293-degree heading after takeoff—a standard westerly heading at Duluth to avoid the congested areas to the east. We were to contact sector headquarters on channel 3, and climb at full throttle to 45,000 feet.)

By that time we were in takeoff position. Pugh revved it up, released the brakes and my head snapped back against the seat rack. If thunder could hum, it would sound like a jet fighter on takeoff.

We were off the ground within 3000 feet, and Pugh was on the air. "Hello, Majority. VN-01 and 02 climbing 293, gate."

The intercept director answered. "Roger,

(Continued to page 180)



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Zero One. Turn starboard to three-six-zero. Dolly check."

(Turn right and fly straight north. Check the data link. This last is the fantastic system by which the intercept director sitting in front of a console, inside a building with walls four feet thick, can fly a supersonic plane hundreds of miles away. His computer feels information to the computer aboard the aircraft which, in turn, controls the plane's autopilot. The pilot except for takeoff and landing, and firing the missiles—NORAD still wants human control over these—can fly "hands off.")

Pugh checked his instruments.

"Dolly sweet."

"Roger, follow dolly."

And not another word was spoken. Under actual combat conditions, voice communication could be jammed, but the data-link system is impossible to jam. I could hear the engine hum behind me, and the air whistle as we streaked through it, climbing close to the speed of sound.

The instruments, meanwhile, kept up a running account of the battle, the dials clicking constantly, giving our position, the target's and the relative bearings of both. We were climbing straight north at Mach .95, slightly below the sonic barrier. The target was at 45,000 feet, heading 175 degrees, at a 45-degree angle from us, 95 miles away and closing fast.

Down below the intercept director had both tracks on his scope. He was pointing us, not head-on to the target, but offset slightly to the left. He was pointing us, appropriately, for "offset point," a pinpoint place in the sky that his computer told him would bring us broadside to the target.

In the plane, as we leveled out at 45,000, I could see vapor trails ahead of us.

Several of the instruments flipped to new readings, and the 106 banked gracefully into a right turn. Our new heading was to be 90 degrees, and—look out!—our new speed, mach 1.25.

Pugh took over the controls and the plane leaped forward with a new roar as he slammed the throttle into afterburner.

They told me earlier that breaking the sound barrier would be a disappointment, that nothing much happens. The mach gauge hung momentarily at .95, then jumped to 1.1 and kept rising, and the plane kept right on flying.

Pugh broke the spell and the silence with the first words since takeoff. "Hello, Majority. VN-01. Contact!"

The target was looming up fast on the left and, at the second "offset point," our plane banked again to the right, sliding in behind the target but closing the gap fast.



Finally, I got some sensation of our speed as the vapor trails poured out behind the target's eight jet engines. There was no mistaking it. It was an Air Force B-52. Pugh, I'm sure, had identified it earlier.

He slid right in behind it smoothly, slightly below it and to the right, in perfect position to read the tail number. He called it in then broke off. The mission was over.

Pugh climbed sharply to 53,000 feet to kill the speed, and startled me over the intercom with the ridiculously casual question: "Want to fly it a while?"

#### Off Course, Lost Flight Plan

The B-52, it turned out, had been on a routine training mission, slightly off course, and its flight plan had been misfiled—two of the most common causes for intercept missions. A trace located the plan, and the bomber was contacted and told to get back where it belonged.

If it had been identified as hostile, Pugh would have armed his missiles, used his radar to line up the target, fired and broken off. The second 106, which stayed 15 miles behind us, would have made its pass while Pugh circled, and the two would have kept it up until the bogie was destroyed.

If both failed—which is highly unlikely with homing missiles—the two ships on 30-minute alert would have taken off and intercepted the target all over again. And, by that time, the whole NORAD system would have been alerted, including the Bomarc and Nike missile bases.

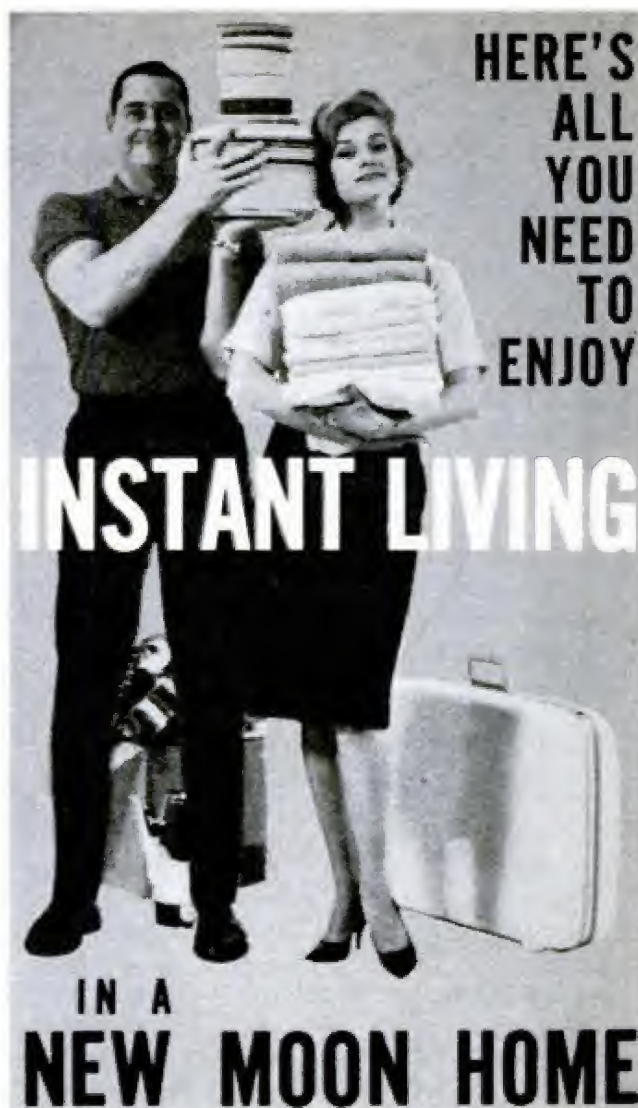
The sky was clear the day I flew, but they tell me that the data-link system can fly a plane in a pea-soup fog close enough to a target to get the color of the pilot's eyes. They also told me that, from the time Sioux Lookout spotted that blip until Pugh called in the tail number, less than 20 minutes had elapsed. Most missions take less than 15.

This was just one simple mission against one target in one sector of NORAD. Multiply it by all the sectors in all the NORAD regions, then by all the men and the equipment, all the way up to the Arctic Ocean and from Midway to Scotland, and you have an idea of the saturation surveillance that is going on every day over the North American continent.

Everything that flies is detected. Everything detected must be identified. Anything unidentified is intercepted. Anything that's intercepted could easily be destroyed.

So far, this has not been necessary.

But if it ever should be, it was comforting to learn by flying a mission with NORAD that the system for tracking and finding these targets has been worked out to such a fine point, and that the men who man the electronic equipment and fly the planes are such artists at their trade. ★ ★ ★



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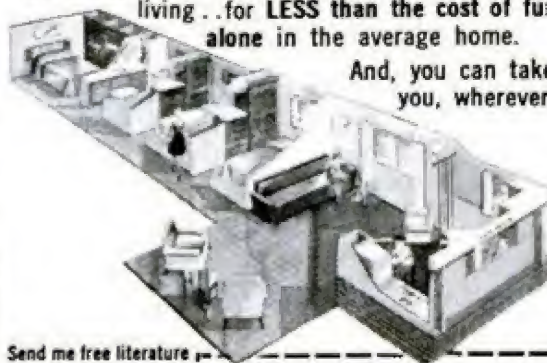
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## Auto Preview

(Continued from page 75)

changes slowly but steadily, paying for each change as it goes along.

At Studebaker, the Avanti almost overshadows the '63 Lark and Hawk, but there will be considerable change in the Lark and most certainly disk brakes on the Hawk. Lark is slated to get itself a new "greenhouse" replacing the roof door pillars and back light. Sheet-metal and trim changes will be designed to further eliminate the car's stubby look which stems from a very roomy body set on a rather short chassis with a minimum of overhang. It's been long on passenger room but a bit short on sex appeal.

There are some general trends cutting across the individual makes in '63 that will bear watching.

Aluminum will show an increase in pounds-per-car average. Cast-aluminum wheels will probably show up as options on one or two models. Aluminum radiators will be used on a significant portion of Chevy II production, certainly on the optional V8 version.

Single headlamps may be creeping back on the scene; Riviera will have them, as does the new Avanti. This is a tacit admission that the dual headlamps aren't as superior as they were once thought to be.

Alternators will come on strong for '63, either as standard equipment or available options on all GM cars, large and small alike. Ford will offer alternators as special equipment.

Transistorized ignition will appear on more than one car. Best bet is that it will show first on the high-performance jobs such as Buick's Riviera, Chrysler 300J, Corvette and the high-performance Ford engine options.

Speaking of Corvette, for 1963 it will get a brand new shape. There will not be a single carryover fiberglass part. The '63 Corvette is reported to be a "fastback" design, not unlike the experimental Shark that was recently exhibited.

The new Valiant and Dodge Dart are joining the single headlamp group. This trend could grow into a stampede, as it permits the stylists much greater latitude in shaping the car's front end.

The trend toward longer intervals between service is stronger than ever for '63.

Chevrolet adds a new twist as it adopts extended-interval chassis lubrication. Newly designed suspension and steering joints will each contain a large, factory-filled reservoir of conventional grease. (Other lube-free designs call for a molybdenum-based grease). However, the usual fittings

will be retained on the premise that if the car should squeak before 30,000 miles, it can be lubricated at any service station.

Among all the engineering advances and styling changes, there's one new item common to all 1963 cars. Front turn-signal lamps, no matter where located will be amber instead of clear plastic for better visibility and quicker recognition both day and night. ★★★

---

## Space Data Displayed on Screen

Infrared-sensed data flashed back to Earth by future orbiting satellites will be instantly projected in color on a large screen that can be viewed in normal room light.

This "situation display console," which military commanders can use to monitor space wars, is being developed by the General Electric Co. for use with the U.S. Air Force's missile-defense alarm system.

The new equipment is based on a light-valve projection system that will give immediate, high-intensity, multicolor displays with much higher illumination than possible with current cathode-ray tubes.

## Wildcat Well 70 Miles at Sea

In a record drilling operation, a group of oil companies are searching for oil 70 miles out into the Gulf of Mexico, south of Morgan City, La.

The record distance from shore is in wildcat, or unexplored, territory. The off-shore rig, erected in 180 feet of water, will eventually support equipment for five wells from its platform.

The 900-ton structure is being financed by several rival companies, a common practice today. When the cost of an unusual operation is too much for one firm to handle, several pool their resources.

## Three-Eyed Picture Tubes

Air Force B-52 bombers will carry three-eyed picture tubes, resembling TV tubes, to aid in guidance.

The eye of one side window looks at a map and feeds this electronic picture to the tube face to provide airmen with a continuously oriented background against which other aircraft and targets reported by the radar are displayed.

The other side window is a camera eye that also looks at the tube face through the inside of the tube and captures a permanent record of the composite picture on the screen. Thus, it makes an historical record for subsequent analysis.



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**GRIP TORC tools** 17480 SHELburnE WAY LOS GATOS, CALIFORNIA

## Minutes in Color

(Continued from page 135)

amine it to see how much more etching must be done. Average etching time is 15 to 20 min.

When the etching is complete, and all of the copper is removed from the etched areas, wash carefully in running water, and then use an alcohol-dipped swab to remove the acid resistant paint. Your etched circuit board will now look somewhat like the one shown in Fig. 3. Finish the job with a light buffing with steel wool to remove any oxidation. Drill small holes right through the copper and the plastic, to permit wiring. These holes should be located in outer corners of each copper contact area. You can now wire the circuit board, using color coded wire. Do not use excessive heat, and avoid using more solder than necessary, as solder blobs will interfere with the contacts.

## Pill Bottles for Numerals

For the second phase of the work, prepare twelve small bottles. These can be white polyethylene, or glass. I used glass bottles which were obtained from the family physician. They were opaqued by painting the inside several coats of white pearlescent nail polish. While the nail polish is drying, you can solder a wire to the base connection of each bulb, and dip twelve bulbs in green lacquer, twelve in red. Allow these to dry. Meanwhile, you can prepare the face of your clock. Any material can be used, I used a 1/4-in. walnut veneered panel. This is marked for the numeral spots, Fig. 2, and drilled to fit the bottles. Finish the panel, then cement the bottles in place with a clear epoxy, and when the cement sets, apply a coat of black paint to the parts of the outside of the bottles which are back of the clock face to prevent light leakage.

The final step is to connect the common terminals of the lamps and run the wires from the lamps through the bottle caps. A small soldering iron will nicely puncture the caps to permit this. Place the caps and the bulbs into the bottles. Mount the clock to the etched circuit board and then mount the board to the rear of the clock face. Now connect the wires from the etched circuit to the wires connected to the lamps. Follow the diagrams, Figs. 1 and 3.

Finally, clip the clock hands to proper length and solder the relay contacts in place. Replace the clock hands and adjust the contacts with a long-nose pliers. The switch will permit you to turn off the bulbs entirely without stopping the clock, or dim them to half brightness. ★ ★ ★





*"Of course I love you, Cyril, but when I see that cute service station man putting Mac's No. 13 rust inhibitor in our radiator, I go all to pieces. Please let's go back just one more time."*



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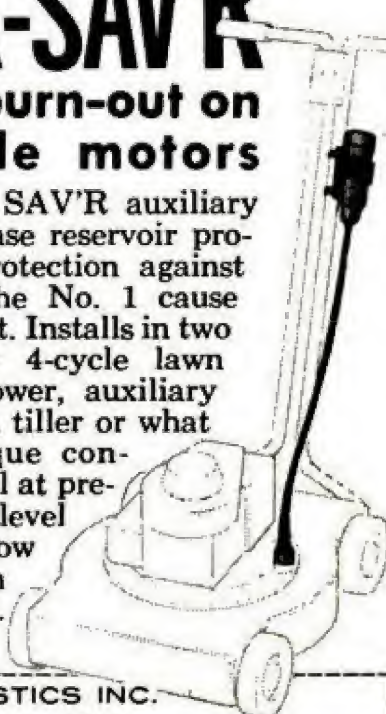
AUGUST 1962

Fifty money-stretching tips for home buyers. You'll find these clever budget-easing ideas in Popular Mechanics September issue.

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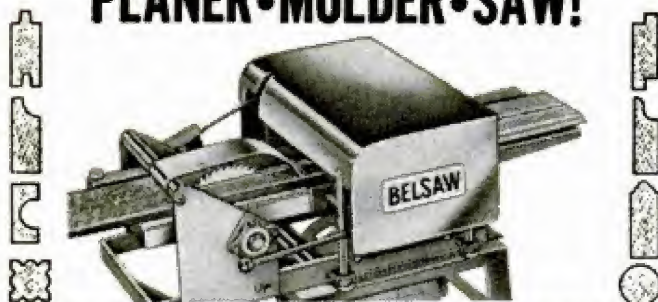
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## Getting Rid of Stumps

(Continued from page 149)

Chemicals to increase flammability should be applied in late spring or early summer. After cutting the stump flush with the ground, bore 1-in. vertical holes 6 in. deep at 6-in. intervals. These should extend out to within 2 in. of the bark.

The chemicals used come in powder form and must be mixed with water to the consistency of thick molasses. You'll need about 2 lb. of this mixture for a stump 12 in. in diameter, pouring  $\frac{1}{4}$  cup into each hole. Add a few drops of liquid household detergent to increase penetration of the chemical mixture throughout the stump.

After treating the stump, cover it with a protective sheet of plastic or other waterproof material and leave it for two or three months. Begin burning in the late summer or early fall, preferably after a long dry spell, using kindling wood or charcoal to start the fire. Depending on its size, the weather and the thoroughness of chemical penetration, the stump will smoulder for from one to three weeks before being reduced to ashes. To hasten burning, place a reflective cover made of aluminum foil on a frame of 1 x 1 lumber over the stump. Be sure that one side of this cover is elevated a foot or so off the ground.

Since the chemicals used here are poisonous, it is advisable to wear rubber gloves when applying them. Be sure to keep them out of reach of children and pets. ★ ★ ★

## QUOTE: We're All Bricklayers

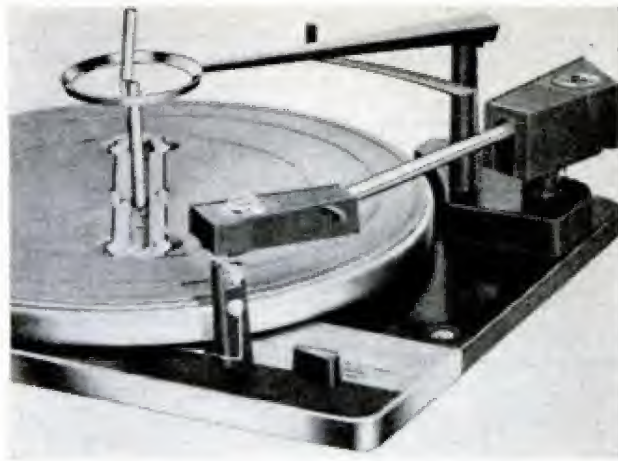
"Creative thought, the surge of human intellect into the unknown, is the basis for scientific progress as it is for virtually all of man's intellectual activities. Creativity in science, however, is unique in the sense that no new idea, no matter how small its impact, is ever lost. . . . All of us are artisans, our efforts devoted to some small part of the structure. Occasionally an Einstein will appear, or an Edison, or a Fermi, and some portion of the edifice will grow apace and be greatly enriched. We can all aspire to such a contribution, but however short we fall, there will be something in the structure that bears our name—perhaps a single brick, perhaps no more than a bit of the cement that binds the masonry together—but something remains that is ours and ours alone. In this concept I think lies the charm and the great appeal of a scientific career and the reason so many choose it."

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**CAN'T LOSE THIS SPINDLE!** It's permanently mounted to the turntable. Easily retracts when not in use



**BRUSH-OFF.** Stylus is automatically cleaned when arm cycles. Brush disappears into tone-arm rest

## Scratch-Free Phono

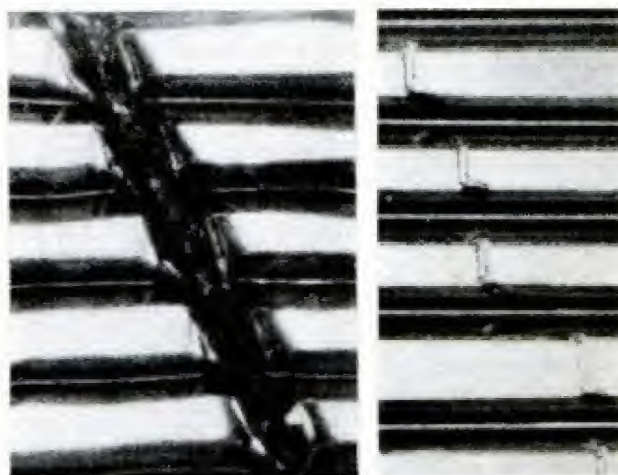
*Even when the tone arm is deliberately dropped, there's little damage to the disc. And the stylus is cleaned automatically*

IT LOOKED LIKE a fairly standard console. . . . Nicely designed but not extraordinary in detail. The only thing unusual was the man demonstrating the unit. How he ever got the job was a mystery, for after the amplifier warmed up, he said "Now listen to this record."

He abruptly dropped the tone arm on the rotation disc. It bounced twice. "Woops," he said, "too far." He put his finger on the tone arm and pulled it back across the record with a loud, protesting "SCRRRAPE!" from the speakers. It wasn't until he pushed the tone arm back again, that we realized the action was deliberate. He was demonstrating a new cartridge.

The secret lies in the fact that this ceramic cartridge tracks at a mere two to three grams. Brushing the arm across a record still produces some harsh grating sounds, but does not damage the disc! While this is true, we had to try it ourselves. Gingerly, we flicked lightly at the tone arm and jumped back as it skittered across the record. The only damage done was to our ears. Neither record nor stylus seemed to have been injured.

The new Zenith Magic-Touch 4-speed



**SCRATCH DAMAGE** caused by stylus (left) ruins the disc. New stylus (right) barely marks the flats

turntable has several other features of interest. As the arm returns to the rest during the changing cycle, a small brush raises from the rest and wipes the stylus. As the arm moves on to play the disc, the brush returns to its retracted position.

In the past, phonographs either used 45-r.p.m. adapters in the record (called "spiders") or an accessory spindle to adapt the unit to the large hole; the spindle would often be misplaced. The Zenith has the 45-r.p.m. spindle built into the turntable. It is geared so that raising one arm causes the other to raise as well.

A small lever, mounted at the rear, is used to sense record size. During the change cycle, this lever moves forward and gently taps the disc on its edge. The information obtained in this movement determines where the tone arm will drop.

While these unusual features are appealing for their novelty alone, the Magic-Touch phono as a whole performs excellently. At present the turntable is available only as a component in Zenith hi-fi consoles. But the phonograph will soon be made available as a unit which can be purchased separately.



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## Pad Sander

(Continued from page 165)

Attaching a suitable handle and switch to the motor pictured is comparatively easy. Fig. 6 shows one alternate method of attaching a bracket to the motor housing where there is no lug, or boss, cast on the housing. In some cases, you may have to improvise a free-standing handle similar to that on a hand plane, also provide some other means of mounting the switch. This might be done by extending one or both ends of the adapter plate and utilizing these projections for mounting a handle and switch. The original switch housing and handle bracket are detailed in Figs. 8 and 10.

The sandpaper is held on the pad, which is faced with felt or rubber, by means of rubber bands and two hardwood locking wedges, Fig. 9. The bands are snapped over the wedges as in the photo.

Fig. 11 details the carrying case and shows how the resistors and the receptacle panel are mounted in the case, with additional space for storing the sander and several sheets of sandpaper. In use, the sander is plugged into the receptacle as pictured on page 164 and the power cord from the resistors is plugged into the 115-v. line. ★ ★ ★

## Power Off? Light Turns Bright

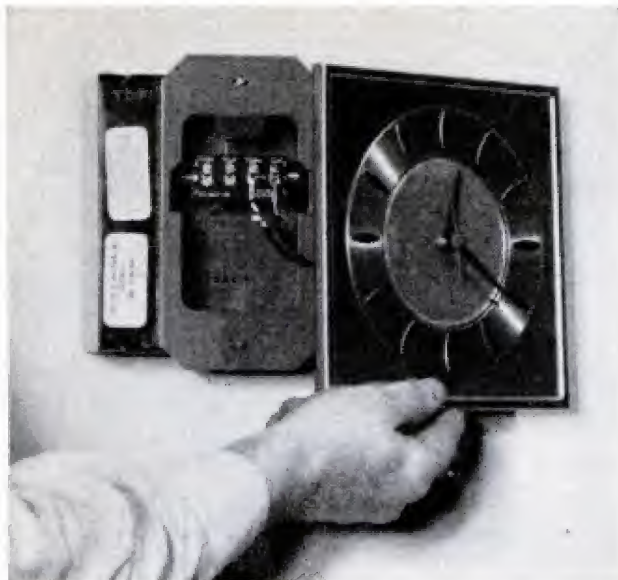


Plugged into an electrical outlet, a new light is an emergency light, rechargeable flashlight and night light in one unit. Normally, it serves as a night light, with its electroluminescent panel glowing. However, if power fails, a bright light powered by rechargeable batteries turns on automatically.

A product of Gulton Industries, the light sells for less than \$15.

POPULAR MECHANICS





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The clock face is available in modern, provincial or colonial styles. The 16-volt clock mechanism operates from the 16-volt chime transformer.

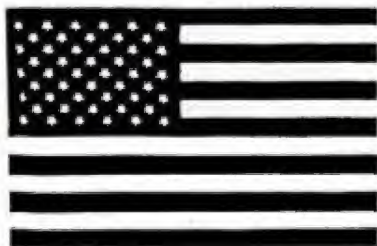
The clock-chimes, which sell for \$15.50 and up, are a product of NuTone, Inc., Cincinnati, Ohio.



**Does your child get at least 15 minutes of vigorous exercise —every day— at school?**

If not, it's up to you to demand more emphasis on physical education. Act at your next PTA meeting!

*The President's Council on Youth Fitness*

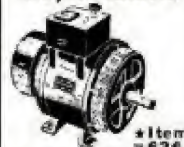


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AUGUST 1962

## GIGANTIC SURPLUS SALE!

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## Fish Deep in Summer Heat

(Continued from page 95)

kept deep by using a pumping, pull-and-slack retrieve, allowing them to sink between pumps. Some, like the two spoons shown on page 94, are made specifically for a deep, jigging retrieve.

Jigs and jig-and-plastic-worm lures do a fine job of scratching the bottom. They sink better than stones, which is the big reason for their sudden popularity. You can't help but fish them deep, and fishermen who never fished below 15 feet before are taking fish at 40 feet simply because the leadheads get there before they can finish their retrieve. But even the leadheads will only give a 30 to 50-foot working retrieve from a 100-foot cast over 50-foot-deep water.

You can increase that distance by giving the lure all the slack line it'll take while sinking, retrieving it as slowly as your patience and its action will allow, and working it as close to the boat as possible before lifting it off the bottom. Even then you're spending a lot of time and effort to cover only a few feet of productive water.

### Change Your Style

To extend the working area of a lure in the middle depths, and to get a lure 'way down when your quarry is in really deep water, you have to change your style. Casting won't do it one third as effectively as drifting or trolling. Some casters, especially shoreline bass fishermen, regard the troller with scorn, and insist that trolling is dull. It is—if you drag a lure or bait around all day behind a throttled-down outboard. But it needn't be; trolling or drifting can be every bit as sporty as casting. Properly done, it can be as interesting as a long retrieve.

Basic trolling is pretty simple. You put a lure or bait over the side, pay out line until you're fishing the desired depth, then keep it going until you either catch something or decide to try another depth. Rod and reel aren't too important—you can use the same gear you'd use for any other kind of fishing, though it helps if it's a little heavier. The three most important factors for success are your terminal tackle, line, and the way you handle your boat. If you combine the right ones, you'll double your catch over anyone using "conventional" trolling methods. Here's how:

The three-way rig shown in foreshortened form on page 95 is my favorite. Your main line from the reel is attached to one eye of a three-way swivel. Your lure drops back from another eye on a monofilament or solid wire leader at least three feet long, preferably six or eight. (I usually make the

lure leader the length of the rod I'm using to simplify landing fish and handling the rig ashore.)

The pound test of the main line and the lure leader should be about equal, with the lure leader a couple of pounds lighter. That way, if something breaks, you're only out one lure instead of a couple of hundred feet of line. The third eye takes a much lighter line to hold your sinker, since it can hang up pretty easily, and it's the most expendable piece of tackle down there. The sinker leader should be from a foot long to half the length of the lure leader. With experience, you'll learn to adjust the sinker leader until your lure is working the desired distance above bottom when the sinker is touching occasionally.

For this kind of fishing, your lure should be as light as possible, and should give a good action at the lowest possible speed. The low-speed floating plug and ultra light, thin spoon shown on page 94 are ideal. With bait, a minimum of weight is usually best; some fishermen even install a small float just ahead of the bait to make sure it stays off the bottom. A lip-hooked or harnessed minnow works best as bait.

### Use a Trolling Plane

Shown with the rig are four weight systems. For trolling at fairly high speeds, especially in salt water, a trolling plane is ideal, since it'll plane your lure to a maximum depth with a minimum of dead weight on your line and strain on your rod.

For ordinary slow trolling or drifting, the long, thin "pencil sinker" works very well, and is nearly snagproof. The break-away rig is even more snagproof—the sinker is held onto the leader by a pinched split shot; no knots at all. If it hangs up, the line will slide through the shot, dropping the sinker but saving the rest of the rig. The jig sinker makes a deadly combination in states where two lures on a line are legal—it works as a sinker, but catches fish, too. Sometimes more than the lure.

The line you use will make a big difference in your success. Surprisingly, lines that cast well troll badly, and vice versa. The soft, light, braided line on your casting reel is worst of all. Its high water resistance and light weight will make a big "belly" between rod and lure. It'll be tough to get down very deep without a lot of weight ahead of your lure, and even then the belly in your line will make it hard to feel bottom or strikes, and harder to strike back at a fish.

Best line for drifting or trolling at depths over 50 feet is light solid wire. It's very heavy for its diameter, and has a smooth surface for low water resistance. In many

(Continued to page 192)





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cases, you can get to reasonable depths with no weight at all; the wire supplies the weight. Braided wires are second best; their added diameter per pound creates somewhat more water resistance than solid wires.

Unfortunately, the unchallenged superiority of wire for fishing deep is balanced by its handling difficulty. It's springy, kinky, and tough on reels and guides. With a little experience, you can learn to handle it, but it looks formidable to the beginner.

Best compromise between unweighted lines and solid wires are the lead-cored lines, which are a braided line around a core of dead-soft lead wire. The wire supplies plenty of weight; only trouble is that its diameter is many times that of solid wire, so it offers more water resistance. Saving grace is that it's as easy to handle as braided line. A new lead-core, Gladding's Special Mark Five, is plastic-finished like a fly line to reduce friction, which helps.

### Metered Spools

One other advantage to lead-core is that it comes in metered spools—the braided outer layer changes color at intervals, usually thirty feet, so you can tell at a glance how much line is out. You can get metered monofilament the same way. Either one saves a lot of trouble measuring or estimating the amount of line out—an important factor if you aren't bumping bottom at a known depth.

You can add wire line to your regular casting outfit easily by simply adding 50 or 100 feet of light wire on top of your regular line. Light wire—8 to 15-pound test—is very thin, and doesn't take up much room on the spool, and will work nearly as well that way as with the special tackle. When you aren't using the add-on wire, keep it handy on a large-diameter storage spool.

It boils down to this: The smallest, smoothest line works best. A smart fisherman will use the heaviest, least resistant line he can handle for best results.

One way to beat the line problem is to use a Seth Green rig, an old deep-fishing dropline developed in New York's Finger Lake country. Usually fished on a handline, the rig is almost a vertical trotline with a heavy weight on the bottom and lure or bait leaders spaced above it. Some states only allow one or two lures; others permit more. The idea is that you'll probably have a lure working at the right level, wherever it is. With no rod, you can use a couple of pounds of weight if necessary, and hit bot-







## Tires Take a Beating

(Continued from page 160)

and smooth. 4) Clean the inside and outside of the valve hole with steel wool. Smooth off burrs and rough metal with a file. 5) Make sure the tire's bead and sealing ridges are clean. (Only certain makes of tires have sealing ridges.) 6) If you have tubeless tires, he will make sure a valve designated by manufacturer's specifications is installed, since valves vary as to length and diameter. 7) Lubricate tire beads, rim flanges, and bead ledge areas with a liberal amount of recommended rubber lubricant. 8) When the tire is mounted, he will make sure the valve core is in the valve before inflating. If at 40 pounds air pressure or less he does not hear the popping sound that indicates sealing of the beads, he will deflate, relubricate, recenter the tire on the rim, and reinflate. After the beads have seated properly, he will reduce air pressure to that recommended.

### Recapping

If you are thinking of recapping the tires now on your car, run them only until the tread design very nearly disappears in the center or, at most, until the tread is very thin about  $\frac{3}{4}$  of the way across the tire. If the tread is worn too thin, or is worn off entirely, recapping is not possible or safe. Tire manufacturers caution drivers against six bad driving practices that ruin tires. These are speeding, fast starts, heavy braking at high speeds and on downgrades, high-speed turns, sharp turns at slow speeds and sudden stops.

Perhaps the chief cause of tire failure is speeding. When driving at only 50 miles per hour, a centrifugal force of two tons is acting on the tire, tending to pull it apart. At a sustained speed of 70 miles per hour, tires generate sufficient heat to boil water. When speeding, tire tread is stretched and contracted—see the photo on page 156—setting up stresses that tend to separate the tread from the body, pull the plys apart. High-speed distortion is much more damaging when tires are under-inflated. Modern tires take this kind of punishment regularly and still hold together, but you can see that tire life shortens proportionally at speeds much above 50. When high sustained speeds are anticipated its good practice to increase air pressure four pounds above the recommended pressure.

As for the other bad driving practices the results are obvious. Fast starts and sudden stops leave rubber on the road. Hard, short turns rub miles off the treads in much the same way only at a somewhat slower rate. Keep these six bad practices

always in mind and adjust your driving to avoid them. The result is longer tire life, as well as increased driving safety.

Underinflation speeds up tread wear by causing excessive flexing of the tire walls, which creates a high degree of internal heat. Heat softens rubber, causing it to wear off more rapidly. Underinflation also causes a tire to roll on the tread shoulders, resulting in rapid, uneven wear. On the other hand overinflation causes a tire to bounce. It permits the tire to slip, which wears off tread rubber rapidly and unevenly. Since an overinflated tire has less of its tread area on the road, there also is a loss of traction and faster wear in the center of the tread.

### Five Rules

There are five rules regarding tire failure due to improper inflation. These are 1) make sure tires are kept inflated to recommended pressure. Check pressure only when tires are cold. 2) Never reduce (bleed) pressure when tires are hot. It is normal for tires to build up a few pounds of air pressure after a run. Bleeding tires to normal pressure when they are hot results in excessive flexing of sidewalls and abnormally high internal temperature when running. When the tires cool off, they will be badly underinflated. 3) Make sure valve caps are screwed on finger tight to prevent loss of air through the valves. 4) If a valve leaks, the chances are the core is faulty. Replace with a new one. 5) When air pressure takes a decided drop, check for slow leaks and repair at once.

The simplest of all tire maintenance procedures—proper rotation—can get you 20 to 30 percent more mileage from your tires, regardless of driving habits, road conditions, or the car's mechanical condition. That's from 4000 to 6000 extra miles, assuming the average life of a set of tires is 20,000 miles.

Another way to reduce tire replacement cost is to analyze your requirements before buying tires. All-nylon tires, for example, are recommended if you do mostly sustained high-speed driving. Maximum traction tires, on the other hand, are best for the cornering and start-stop-turn driving experienced in cities.

A final maintenance tip concerns tire chains. Chains are made to creep on a tire, so the links won't gouge into the rubber. Make sure chains are never put on too tight and that they are the right size for the tire. Never underinflate or overinflate tires to make them fit the chain and, of course, never drive with tire chains on bare pavement, since this practice ruins both tires and chains. ★ ★ ★





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## Cantankerous Gramp

(Continued from page 89)

proach. Alerted ground crews had the field arresting gear ready for him.

Beginning his final 180-degree turn to the runway, the pilot was informed that the entire lower fuselage had erupted into flame. Further, his engine flamed out.

The pilot pulled the nose up and away from the field, then ejected safely.

The pilotless plane, though, turned toward the naval air station and plunged toward the hangars. Alarms were sounded on the ground, then the FJ veered—this time toward a big aircraft carrier tied to a pier near the field. Fortunately, the plane continued to turn and crashed directly under the stern of the carrier.

"Sonofagun! It's mighty difficult to chew out a man who's done everything just about perfect—kept his head, brought his machine home like a real pro, and made an attempt to steer it clear before he ejected after having an excellent precautionary approach turn to a can of worms," was Grampaw Pettibone's comment.

"When you've got a wounded bird and the chances of getting it on the runway in one piece are only so-so, why aim it at the home folks at all? If it looks like it'll be an ejection anyway, it's far better to do it over a safe zone and cut down on the chance of a major disaster."

### Created by Captain Seth Warner

That ancient flyboy, Grampaw Pettibone, who has been preaching against the flying sins of Navy and Marine pilots for nearly 20 years, is the creation of Capt. Seth H. Warner. Captain Warner, who admitted to a number of flying sins of his own, used his own backlog of experience to teach safety to new pilots as he built up the colorful character of Gramp until he retired after World War II. Now the authorship is anonymous, though the artist, Robert Osborn, who started drawing Gramp back in 1943, still does all the illustrations in his famed style.

Grampaw still remains a very human being, as was proved one night at an air station. His radio out and unable to locate the light switch in his SNJ trainer, Gramp made a downwind landing on the wrong runway and almost went into a nearby bay.

He walked into the operations office, only to find rows of sailors making a great show of reading Grampaw Pettibone's pages in *Naval Aviation News*. And later, when he was ready to depart, one requirement for his clearance from the field was that he promise to write himself up. And very humbly, he did. ★ ★ ★



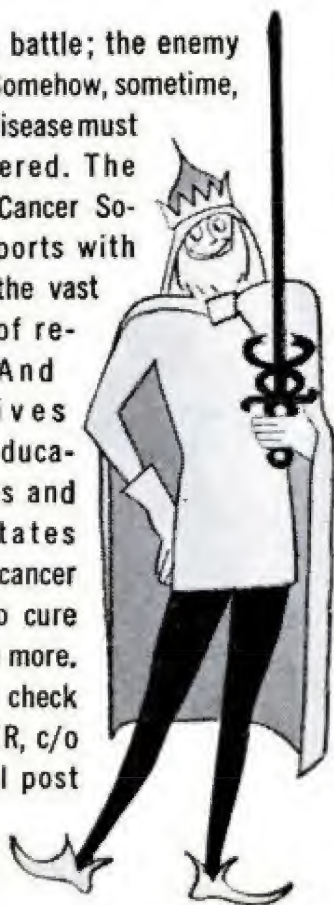


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## PM-38

(Continued from page 146)

Next, install the beams and brackets which make up frames 1 and 3. Secure brackets to beams with glue and two 1 $\frac{3}{4}$ -in. No. 8 screws per joint. To mount the half frames, drive two 1-in. No. 8 screws through the side planking into each bracket, countersinking each slightly.

Notch the deck beams of frames 1, 2 and 3 for the 1 x 4 center deck batten. The fore end of this batten will have to be notched also to fit around the stem. Use two 1 $\frac{3}{4}$ -in. No. 8 screws and glue to attach this batten at each joint. To complete the deck framing, install the two outer deck battens, fitting them into notches cut in frames 2, 3, 4 and the transom. Bevel the fore end of each to fit against the side planking. Secure with glue and one 1 $\frac{3}{4}$ -in. No. 8 screw per joint. Before planking the deck, plane the edges of sheer rails and plywood side planking to conform to the curvature of the deck beams and transom.

Plank the deck as you did the sides, using glue and 1 $\frac{1}{4}$ -in. nails spaced 2 in. apart, Fig. 7. Utilize scrap  $\frac{3}{8}$ -in. plywood from the bottom planking panel as backing plates for the butt joints, Fig. 12.

Mount the seat risers first, Figs. 5 and 8, attaching them with glue and one 1 $\frac{3}{4}$ -in.

No. 8 screw per joint. Since the seat bench is made from scraps cut from the same panel as the seat itself, saw out the seat before making up the bench. If necessary, you can adjust the dimensions of the bench, Fig. 4. Use glue and nails to assemble the bench and mount it on the keelson. Fasten the seat to the risers and bench with 1-in. No. 8 screws and glue, then secure the seat back to the seat bottom with three inside corner plates and 1-in. No. 8 screws. Finally, trim the seat head to fit, attach it to the top of frame 4 and cover the joint with a trim strip obtained from the waste of the keelson 2 x 4.

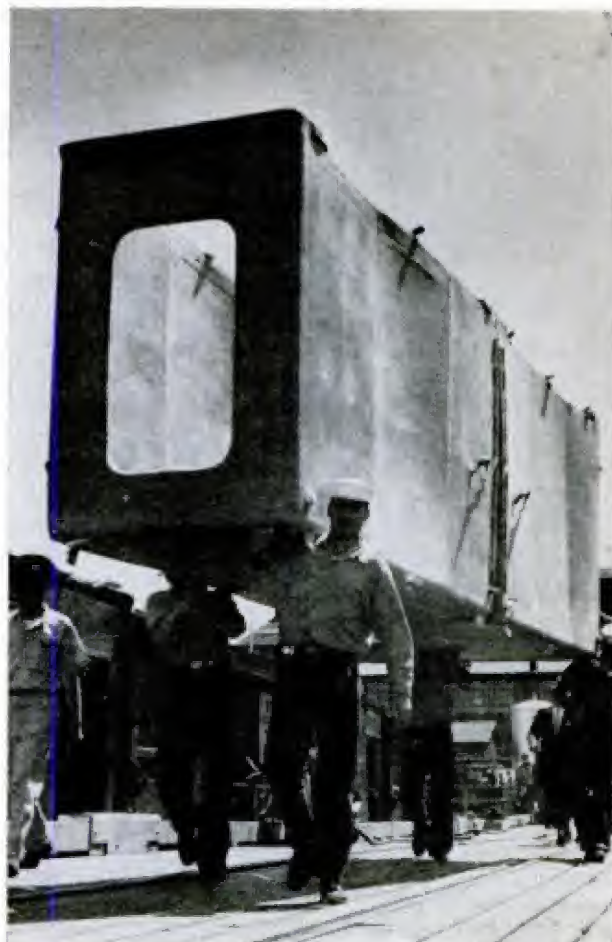
Either make up the motor board from scraps of  $\frac{1}{4}$ -in. plywood left over from the deck planking panel, or (preferably) from a 10 in. x 16-in. scrap from another project. To elevate the motor to the proper height, glue and screw a 1 in. x 1 $\frac{1}{2}$ -in. block to the top of the transom. If possible, reinforce this with a cap made by bending a piece of scrap aluminum, Fig. 13.

While we normally recommend fiberglassing seams before painting, this isn't absolutely necessary and it will make the boat more costly. After painting, all that remains is to install the windshield, controls and motor before loading the boat on your trailer and heading for the nearest water. ★ ★ ★



"I've set the mousetrap. Now hand me the cheese."





## Inflatable Gymnasium for Underwater Calisthenics

Because his underwater sailors might get out of shape during the long submerged voyages of the nuclear-powered submarine, *NS Theodore Roosevelt*, the sub's commander installed an inflatable gymnasium that can be blown up for exercise sessions and deflated for storage in cramped quarters.

Located in the passageway of the torpedo room, the custom-made gym is 22 feet long and 4 feet wide and light enough to carry.

## Thermocouple Is No Weakling

Heat from a gas burner and cold from a glass of water can, indirectly, create a magnetic field strong enough to hold a 180-pound man aloft with ease.

In a demonstration at the Franklin Institute in Philadelphia, Pa., Thomas Earnshaw, director of museum education, was supported by the force of the magnetic field created by an electric current generated when one junction of a thermocouple was heated and the other was cooled.

Heat was supplied by a gas burner and the other junction was cooled by water.

● The bola, a weapon made of weights connected by thongs, was used by primitive peoples about 400,000 years ago. The ancient device is still used today by the gauchoes of South America and some Eskimos.

A punching bag, rowing machine and other equipment can be used in it without danger of injury from the sub's steel structures. The air gym was built by the Goodyear Tire & Rubber Co., which also made inflatable bunks and gangplanks for the sub.





## Life Again in Mummy Cave

(Continued from page 81)

of the trench to make a sturdy retaining wall. The part of the wall which will show above the surface was being constructed of ancient stones. At one point the wall was tied in to a prehistoric retaining wall which the Navajos digging the trench had discovered. They found other things, too—stones for pounding corn, pottery, a belt and woven sandals.

From down in the valley a Navajo shepherd boy sang a hill-billy song, and the men on the kiva good-naturedly joined in.

"What are you singing?" asked Joel.

"That's what him sing on the radiator," replied the Navajo, deftly plying his trowel.

Joel smiled and explained to me, "They mix up words like radiator and radio, but I think they do it on purpose. They've got a fine sense of humor and enjoy puns."

He went on to tell of a Navajo named Charlie who went on a binge and drank great quantities of tokay wine. In the morning he appeared at the work site looking much the worse for his celebration.

"How do you feel?" asked Joel.

"Tokay," said the Navajo with a wry grin.

### Restoration Techniques

During the days I spent at Mummy Cave I saw many interesting construction methods employed to keep the magnificent ruin from sliding to its destruction. I also learned of other techniques. At the White House site which is in nearby *Canyon de Chelly*, archeologists mixed a slurry of cement and fine-grained aggregate and pumped it beneath the building to keep it from settling.

"This method was first used in airport construction," said Rick. "The cement is pumped under pressure with such great force that it can actually rupture rocks."

For the most part the ruins stabilization unit employs ancient timbers in strengthening a dwelling, but in some cases they make a plaster molding of a juniper beam and then cast a concrete reproduction. They cast such lintels for *Pueblo Bonito* in Chaco Canyon, N. M.

"Sometimes when we use a timber, we hide a piece of iron behind it," said Rick.

Rainfall may be no problem in bone-dry Mummy Cave, but it is rapidly washing some more exposed ruins in their end. It accounts for the construction of the huge steel pavilion over *Casa Grande* in the desert near Coolidge, Ariz.

"But, even so, the wind whips blasts of sand beneath the shelter," said Joel.

At Montezuma Well near Sedona, Ariz., archeologists soaked the floor of the ex-

posed dwellings with a new plastic, which hardened without making any change in the appearance. Visitors can walk on the tough surface without wearing it down. When coated with a silicon spray, adobe walls repel water.

### Stabilize Walls by Electrolysis

"We are still looking for a better way to protect the walls from weathering," said Rick. "The latest thing is to stabilize them by electrolysis. The method was first described at a conference on soil stabilization held in 1952 at Massachusetts Institute of Technology and proposed for use by archeologists in the ancient Russell Cave in Alabama. When the material is dampened and a direct current put through it, insoluble aluminates form. This hardens the wall. Archeologists are also experimenting with baking adobe with infrared rays, although the process oxidizes the iron in the material and changes its color."

One night back at the guest ranch at Chinle, I talked to Al Lancaster, archeologist at Mesa Verde, Colo., Charlie Steen, the regional archeologist stationed at Santa Fe, N. M., and John Corbett, chief archeologist, National Park Service, who had come out from Washington, D. C. We had been driven out of *Canyon de Chelly* by high waters, heavy rains and winds which whipped up the ancient dust and choked our lungs. Perhaps this accounts for their gloom. All agreed that unless better techniques and bigger budgets were found, in time the American people would lose all the ruins in the country, mostly because of the action of the elements.

"We're now stabilizing the previous stabilization work at Aztec, for example," said Corbett.

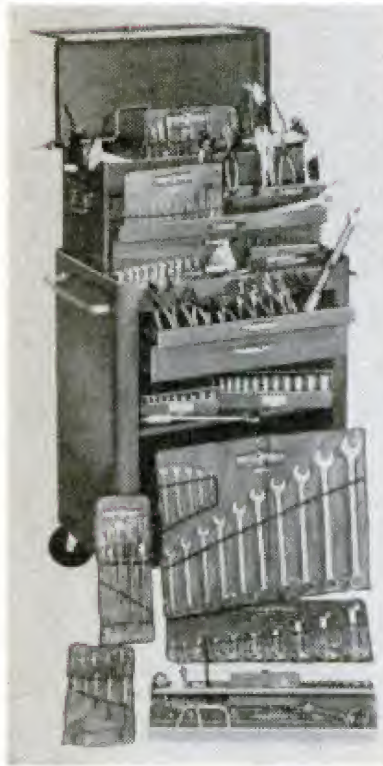
"Too bad that all the ruins can't be sheltered caves," mourned Steen.

Only a few years ago archeology was the exotic pursuit of a small number of men. Today there are tens of thousands of dedicated amateur archeologists—many of whom, the archeologists at *Canyon de Chelly* told me, are doing important work. In a nation which has come to value its past, the ruins-stabilization unit has a significant roll to play. With mortar and scaffold, plastic water repellents, electrolysis, infrared rays and new techniques still to come from laboratories and field operations, archeologists are campaigning to keep their own dire predictions from coming true. ★ ★ ★

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## Mower Has "Clam Shell" Catcher

Discharge from a power mower is caught in a covered grass catcher that flips open like a clam shell for easy emptying. The mower's discharge-control system vacuums the grass and ejects it into the container.

The 18-inch rotary mower has four-blade action and one to three-inch cutting height adjustment. Made by Jacobsen Mfg. Co., Racine, Wis., the mower sells for \$140.



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